# ELECTRICAL REVIEW

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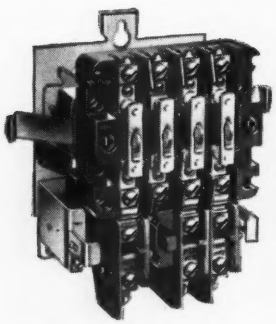

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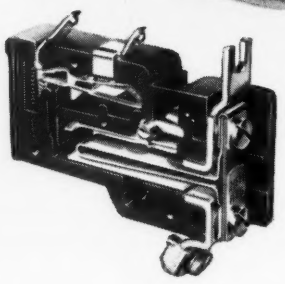

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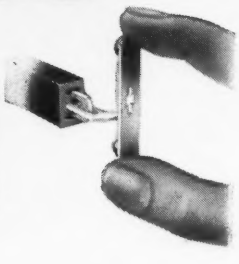

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# ELECTRICAL REVIEW

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4 NOVEMBER 1955

## *In This Issue*

875 HOPES AND DOUBTS
877 LONDON'S ELECTRICITY SUPPLY
882 TRANSFORMER AND PROTECTIVE GEAR CIRCUIT ANALYSIS
887 MAINS FREQUENCY INDUCTION FURNACES
888 PARLIAMENTARY REPORT
890 PERSONAL AND SOCIAL
893 VIEWS ON THE NEWS
894 B.S.I. ANNUAL MEETING
895 INDUSTRIAL NEWS
899 DAIRY SHOW
901 BIRMINGHAM TECHNICAL COLLEGE
902 NUCLEAR RESEARCH MEASUREMENTS
904 THERMAL STORAGE WATER HEATERS
908 GENERATION AND DEVELOPMENT
909 NEW ELECTRICAL EQUIPMENT
911 A.S.E.E. LIST OF EXHIBITORS
912 FINANCIAL SECTION
916 NEXT WEEK'S EVENTS
917 CONTRACT INFORMATION
918 NEW PATENTS

123 REGIONAL GUIDE TO ELECTRICAL CONTRACTORS
127 CLASSIFIED ADVERTISEMENTS
140 INDEX TO ADVERTISERS

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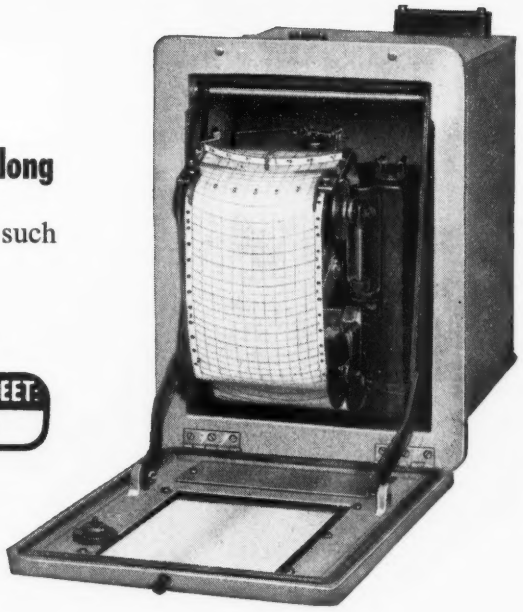

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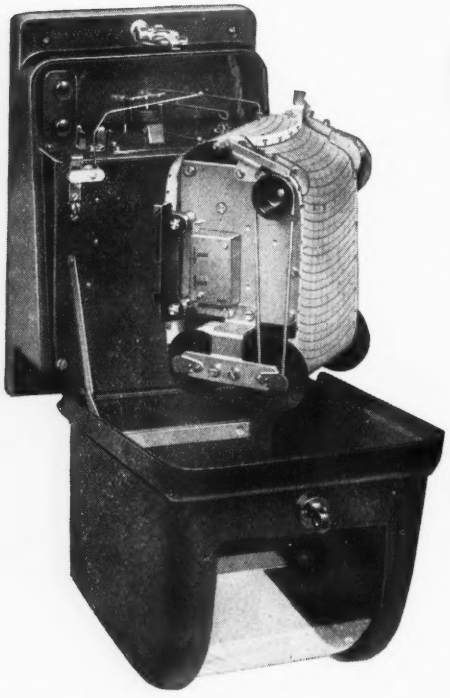

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ELECTRICAL REVIEW

4 November 1955 Vol. 157 No. 19 Established 1872

# Hopes and Doubts

WITH the best possible expert advice available to him the Chancellor of the Exchequer may be presumed to have been fully justified in his fears for the immediate economic future of the country. Although we appear to be very prosperous our prosperity is thought to be precarious and unhealthy. High wages have led to high consumption and ever-increasing costs which are having a bad effect upon our ability to compete in overseas markets.

Accepting the need for a curb upon expenditure, we may ask whether the methods adopted by the Chancellor are the best possible and likely to produce the required results. Will they divert goods from the home market to overseas countries and improve our trade balance? This aim can certainly not be achieved merely by making goods dearer for the home consumer. It is also necessary that other countries shall be ready to purchase from us and this implies considerably greater selling activities by our manufacturers. But some of our best customers are also trying to prevent inflation in their own countries. They are doing this by restricting imports, a method which we dare not adopt for fear of retaliation.

Already Mr. Butler had taken steps to reduce capital expenditure by the " voluntary " control of credit by the banks. In so far as this has prevented a great deal of unessential work it has been good but it is doubtful whether the banks are always able to distinguish between unessential and necessary expenditure and the " credit squeeze " may conceivably have hit production for export.

Now by increasing purchase tax and the tax on distributed profits the Chancellor hopes to reduce the volume of goods purchased by the home consumer. These measures may have the desired effect, but it is possible that by raising the cost of living they will lead to further demands for wage increases in which event our situation will be worsened. Not only has the tax been increased, it has also now been imposed upon household equipment (including electric kettles and irons) which was formerly considered to merit exemption. Water heaters and space heaters, among other electrical appliances, are to bear a heavier tax, which is a step away from the clean air policy which the Government is pursuing. The cuts in electricity authorities' expenditure will be mainly on the distribution and utilization side. It is to be hoped that this doubtful economy will not be too long in force.

Whatever effect the Chancellor's measures may have, there is only one real remedy for our troubles—more efficient and greater production for the money paid out in salaries and wages. Until this is realized and acted upon we shall continue to balance on a knife edge.

## B.I.F. PLANS

It was reported at a Press meeting last week that the plans for the 1956 British Industries Fair were making good progress and that the Electrical Section to be accommodated at Olympia had the support of the B.E.A.M.A. and many of the large electrical manufacturers. Arrangements are being made for a separate "electronics" display within the Electrical Section. It is realized that some concerns will prefer to exhibit their electronic products on their general stands but special attention will be drawn to these by suitable notices. It is contemplated that this electronics show will be the first of sectional displays for other specialized branches of the industry, but there is a limit to the application of this idea. Some reduction in the number of exhibitions may not be a bad thing but this sectionalization will not fit in with the needs of the "comprehensive" firms and will certainly not take the place of the larger separate exhibitions which are now well established and meet real needs.

## OVERSEAS PUBLICITY

It is axiomatic that (in spite of Emerson's dictum) goods will not sell themselves, particularly in overseas markets and much has been said about the need for acquainting buyers with the merits of British products. Some useful guidance on this subject is given in a booklet just published by the Federation of British Industries under the title "Telling Industry's Story Overseas."* This guide to the channels available for distributing industrial information sets out the various vehicles, official and private, by which potential customers may be acquainted with what we have to offer them. It covers newspapers, trade and technical journals, broadcasting and television, photographic agencies, films, etc., and shows how these can be employed. After an appreciative reference to the value of British technical journals the booklet says:—

> "Support by industry of the technical press, both by making information readily available to it and by advertising, can be a very direct way of getting your story across to your public overseas. Some firms have also assisted the circulation of these journals by making gifts of a year's subscription to their overseas customers in place of sending them at Christmas some more conventional gift."

## ELECTRICITY AND STEEL

We have often commented on how the electrical and steel industries have worked hand in hand, each contributing to the progress of the other. One outstanding example of this has been in connection with the development of the cold rolling of steel and we have stressed how the electric drive, with its precise control, has made this development possible and how the result has been the production of steels with such high degrees of machinability that a mass of steel products—pressings, stampings, extrusions, and so on—have been made available at lower cost and in increasing quantities. Now Mr. L. Drucquer, chairman of the Supply Section of the Institution of Electrical Engineers, reminds us in his inaugural address, a report of which appeared in last week's issue, of a further valuable contribution by the steel industry to electrical manufacturing and supply. It is the development of cold rolled oriented steel strip which lines up individual magnetic crystals and thus enables silicone steel to be more easily magnetized and to be worked at a higher flux density, with the result that for given magnetic losses the core sections of the transformers are reduced. This reduction is reflected beneficially in several directions, not the least of which is the increased overall transformer capacity for a given weight which is achieved in view of the Ministry of Transport's restriction on the gross weight of vehicles on the road which virtually limits transformer weight to about 150 tons.

## LIGHTING AND LIVING

In his presidential address to the Illuminating Engineering Society, reported in last week's issue, Mr. A. G. Higgins pointed to one of the numerous media through which electricity must contribute to the desired further increase in the standard of living. The medium in this case is of course lighting. It is generally accepted, we think, that raising the living standard implies in particular bettering the lot of the "lower income group." In this connection Mr. Higgins showed that better lighting in rented premises is often prevented by inadequacy of lighting points in the first place and then by restrictions which prevent tenants from having walls chased to permit the installation of additional "outlets." This echoes past campaigns by such bodies as the Electrical Development Association and the Electrical Association for Women, advocating the provision of more and adequate "outlets" in dwellings and it indicates the need for the continuation of such advocacy. But by no means does Mr. Higgins imply that lighting development has not advanced considerably, for he suggests that the progress is such that the Society might have to bring into its deliberations people other than engineers whose activities are closely associated with lighting developments.

## AID FOR POTENTIAL CUSTOMERS

It is estimated that the additional taxation imposed by the supplementary Budget will raise an extra £112½ million. Presumably this will be devoted to debt redemption; it should not be needed for current expenditure for which revenue is already more than sufficient. Would it not be possible to use these funds for aiding under-developed countries which need such assistance and, indeed, are already assisted by us to some extent? We could not, of course, provide them with funds for buying commodities from other countries, and so, in effect, we would be supplying them with goods which, it might be argued, could be sold elsewhere for cash. This would certainly not improve our trade balance immediately. We should be casting our bread upon the waters in the hope that in future years our beneficiaries would turn to us for their requirements and would be able to pay for them.

* Federation of British Industries, 21, Tothill Street, London, S.W.1, price 3s 6d including postage.

# London's Electricity Supply

## Special Problems Encountered in System Development

By R. THOMPSTONE, Associate I.E.E.*

THE highest electrical load densities in London occur in the central area which includes what is usually termed the City and West End. Although high load densities may be met in more suburban or industrialized districts the problems associated with them are similar to those of equivalent areas of other towns and cities. It is, therefore, mainly with the central section that this article deals as it is here that those problems are met which are peculiar to London.

The area under consideration includes the City of London and the Boroughs of Holborn and Westminster. Its situation and relation to the Board's area as a whole is shown on the map which also compares its load density with that of the surrounding districts. In the area under consideration there are ten main bulk supply substations.

The load is mainly of a business or commercial character with a minor amount of small industrial and residential use, and a good evening entertainment load exists in the West End. As an instance, the energy consumed in the West End district last year was allocated as 81 per cent commercial, 11 per cent industrial, 7 per cent domestic, and 1 per cent public lighting. The population of the area varies from some 3,000,000 in the daytime to 500,000 at night: this gives a direct indication that the load will be very high in daytime business hours but low at nights and week-ends. The proportion of space heating is high and the demand varies steeply with daytime temperatures. A typical daily load curve is reproduced.

The aggregate maximum demand of the area is some 250 MW, individual bulk supply points having extremely high figures in relation to the ground area served. For instance, what was the old St. James' Company's supply area of about a quarter of a square mile, with only 6,600 consumers, had a maximum demand last year of over 40 MW.

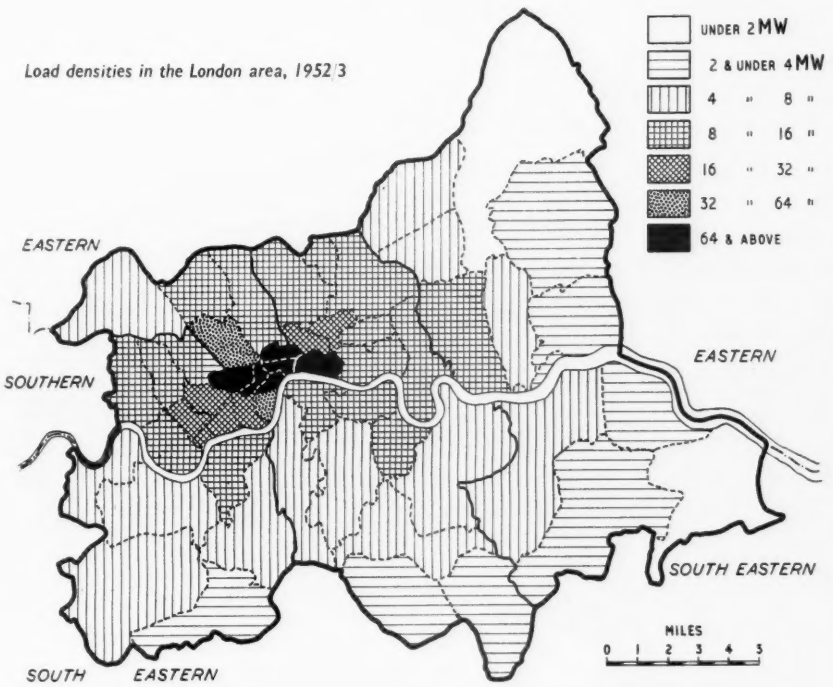
In the " one square mile " of the City with a night-time population of 5,268 by the 1951 census, there is a daytime maximum demand of 110 MW or 21 kW per head of permanent population.

Electricity supplies in this area date from the early 1880's and were usually given on some variety of d.c. system: these had developed to high proportions before a changeover to a.c. began generally in the early 1930's. There are still considerable remains of the earlier systems which are being replaced as funds permit, but the system generally now in use is a.c. three-phase 415/240 V, only some 10 per cent remaining on the various d.c. systems. An idea of the congestion that can occur in one area is given by the multiplicity of supply voltages still in use. These are: d.c., 530 V, 400/200 V and 200/100 V; a.c., 104 V, 230 V single-phase and 400 V three-phase. The standard distribution system follows generally the pattern described by Mr. J. W. Leach in his paper " Standardization of Distribution in Densely Loaded Areas," published in the December, 1941, issue of the *Journal* of the Institution of Electrical Engineers. A brief description of the salient points of this system is given here.

A typical main substation houses four 12 MVA transformers supplied at 66 or 22 kV from the primary h.v. transmission system and stepping down to 6·6 or 11 kV for the local h.v. distribution. Each transformer feeds a ring main having intermediate feeders sufficient to meet the transformer load capacity and operated as individual radial feeders. Each feeder supplies a number of transformer chambers of a standard capacity of 500 kVA, connected to the m.v. street main network.

The m.v. network associated with any h.v. feeder is connected solidly to the busbars of each transformer chamber on that feeder and is run as a complete interconnected grid; it is connected by fuses to the similar

* Design and Planning Engineer, Western Sub-Area, London Electricity Board.




Load densities in the London area, 1952/3

networks of other adjacent feeders supplied by the same transformer at the main substation. The area served by any main transformer is run isolated from that of other main transformers but can be interconnected in emergency. The sizes of transformers and arrangement of the distribution system are designed to give values of fault energy not exceeding 150 MVA on the local h.v. supply and 25 MVA on the m.v. system.

## Substation Site Problem

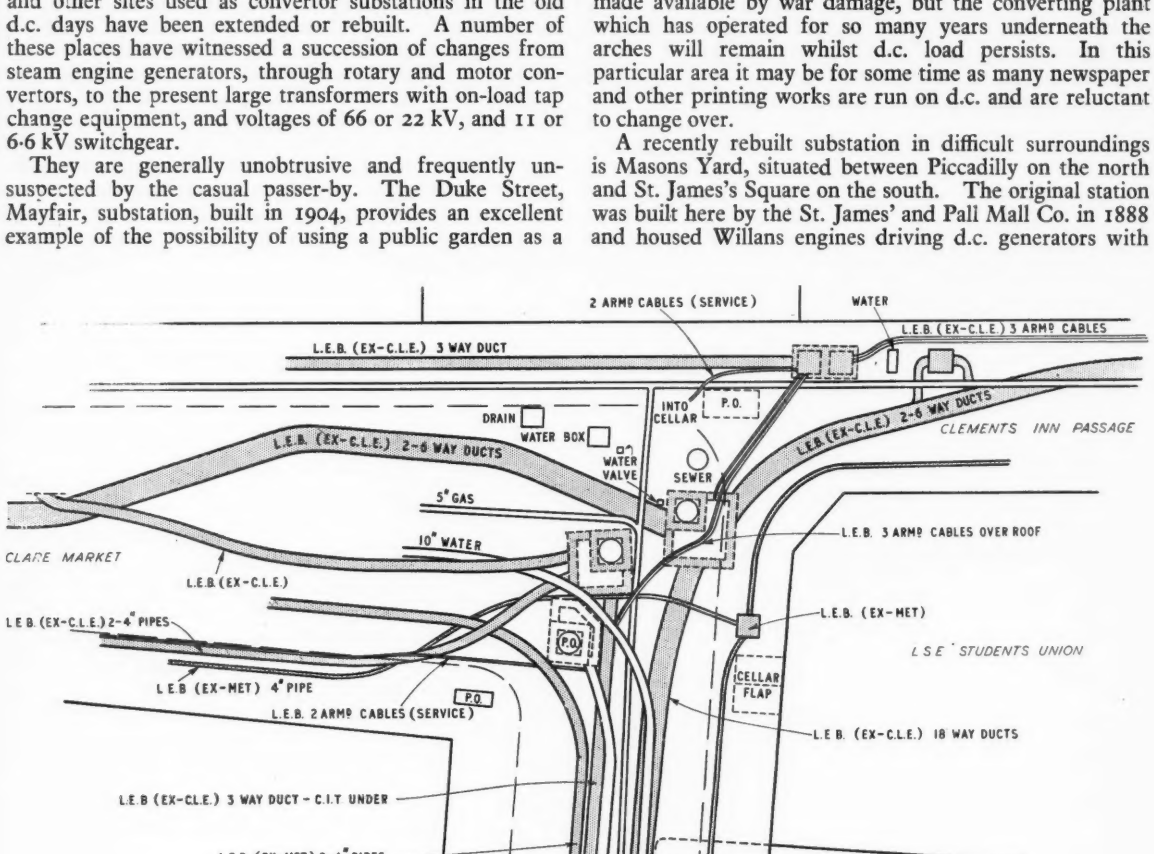
One of the great difficulties in such a congested area is to find sites, consistent with the need for making electricity supplies available at minimum cost, for main substations and transformer chambers as loads increase and new supply points become necessary. The load increase averages from 5 to 7 per cent per annum and therefore each transformer and supply point on the system has to be duplicated every 12/15 years. Fortunately, a number of the sites taken by the original companies for generating stations have been large enough to accommodate suitable bulk supply points and other sites used as convertor substations in the old d.c. days have been extended or rebuilt. A number of these places have witnessed a succession of changes from steam engine generators, through rotary and motor convertors, to the present large transformers with on-load tap change equipment, and voltages of 66 or 22 kV, and 11 or 6·6 kV switchgear.

They are generally unobtrusive and frequently unsuspected by the casual passer-by. The Duke Street, Mayfair, substation, built in 1904, provides an excellent example of the possibility of using a public garden as a supply centre. Here the garden was dug out completely to a depth of about 30ft for the construction of a building of some 16,000 sq ft floor area, and the Italian garden was reconstructed at 8ft above road level, leaving ample ventilation space for the machinery below. This garden with its Grecian temple entrances at each end has become a familiar feature of the Mayfair scene. A similar task was undertaken in Soho Square where an attractive rustic summer house disguises the ventilation shaft of the underground substation, which houses transformers, switchgear and rotary and motor convertors.

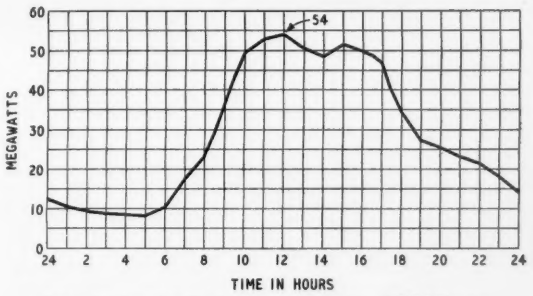
A similar technique has been applied to transformer chambers situated beneath small gardens, paved squares and even roadways, with ventilation arranged as combined entrance pillars or disguised by shop stallboards, garden seats, dwarf walls and similar means.

Railway arches have provided main substation sites at Ludgate and Cannon Street, and a surprising amount of plant has been housed at these sites. It has now been possible to rebuild the Ludgate substation on a vacant site made available by war damage, but the converting plant which has operated for so many years underneath the arches will remain whilst d.c. load persists. In this particular area it may be for some time as many newspaper and other printing works are run on d.c. and are reluctant to change over.

A recently rebuilt substation in difficult surroundings is Masons Yard, situated between Piccadilly on the north and St. James's Square on the south. The original station was built here by the St. James' and Pall Mall Co. in 1888 and housed Willans engines driving d.c. generators with




*Typical congestion beneath a West End street*




*Typical substation load curve in February, 1955 (Charing Cross area)*

a total capacity of 1,700 kW and having coal brought by horse-drawn wagons using the only entrance to the yard through an archway 10ft high. This provided a problem for the 12 MVA transformers now installed but was overcome by special design. The yard is surrounded by property and the reduction of noise was essential. The transformers are installed in enclosed cells at ground level with their coolers in ventilated chambers on the first floor. The basement of the old building has been retained and the old brick arch type retaining walls have been strengthened by internal reinforced concrete walls supporting the new superstructure.

The total enclosure or screening of the transformers, with separate cooling arrangements, is a feature of a number of new projects where noise level must be very low because of the proximity of surrounding property.

The St. Martin's Lane substation—rebuilt after total destruction during wartime—is another place where access is through a low archway, and the site is so surrounded by neighbouring properties that few passers-by realize that a major substation exists there. From these examples it will be seen how essential it is to use equipment of the smallest possible size to meet difficulty of access, and to save costly space. These factors strongly influence the design of the equipment chosen.

In addition to the substations it is necessary to provide sites for mains depots, stores, staff accommodation, etc., and whilst much provision of this nature can be made outside the most congested areas some such space must be made available in bulk supply substations, and this usually entails allocating part of the ground floor or basement for the storage of heavy items, such as drums of cable, with the necessity for special handling equipment.

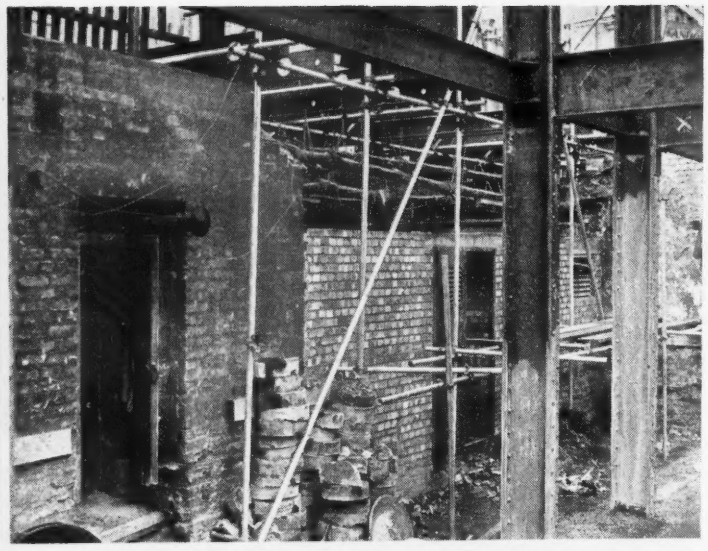
The transformer chambers supplying the distribution network may often be situated on consumers' premises and are arranged to be placed at points of heavy demand and as near as possible to existing m.v. networks in order to minimize cable costs. Because of the high value of building space it is necessary to take as little accommodation as possible, a typical chamber for a 500 kVA transformer and associated switchgear requiring, if of a suitable shape, only 125 to 150 sq ft, and a height of some 8ft 6in. Special switchgear has been developed for such sites and transformers have been given certain limiting dimensions to ease handling in narrow passages, areas, and the like.

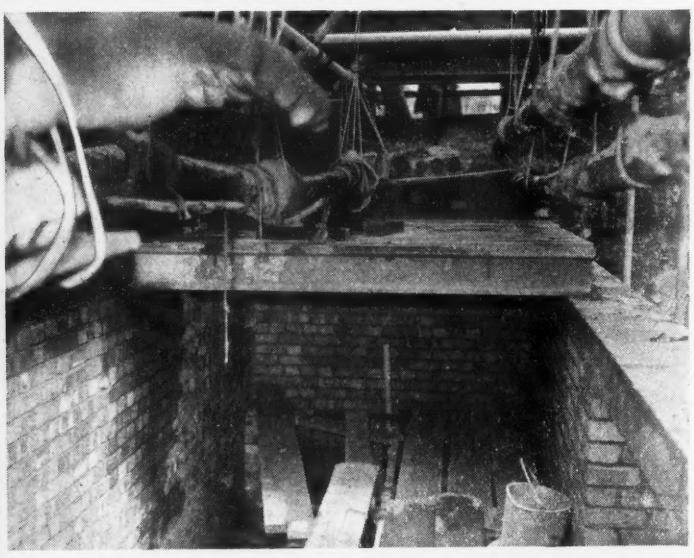
Some transformers with especially low loss cores and of minimum overall dimensions have been developed for the most difficult situations, and the use of such transformers is likely to increase as a general policy.

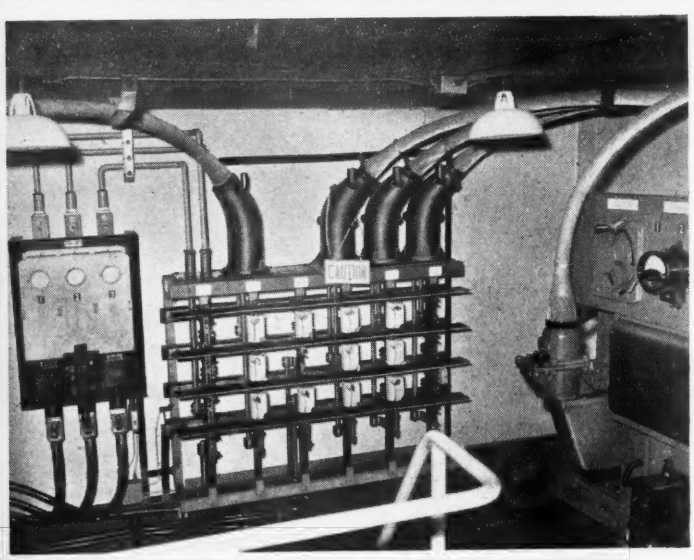
The h.v. switchgear normally used is a composite ring main unit embodying two manually operated fault-making, load-breaking oil switches for the connections to the h.v. ring main and an oil circuit-breaker for the tee-off connection, with overcurrent and earth leakage protection. This is handled as a single unit and can be erected in

*A 12 MVA transformer being moved into Masons Yard, near Piccadilly*

*A high voltage ring main unit being lowered into an area substation*







minimum space with minimum foundation arrangements. The ring main cable boxes are arranged for cable connections from above or below and from front or rear. All jointing can be carried out from the front with the unit erected close to a wall. Cables can come in from any direction either from above or below and cabling from above can be jointed satisfactorily within a building height of 8ft 6in.

The medium voltage switchgear consists of an air break circuit-breaker with overload protection giving a definite minimum time delay, and a multi-way distribution board arranged for wall mounting. The circuit-breaker may be mounted immediately adjacent to the distribution board and connected by copper links, or from a distance by cable or copper rod in a variety of arrangements. The outgoing cables are connected to a medium voltage distribution board with top or bottom cable entry and with straight or angled cable boxes that can be turned on a turret arrangement to provide for any possible angle of entry. This is an essential in some instances where heavy cables of up to 0·5 sq in 4-core have to be handled in confined spaces.

## Co-operation with Architects

The dominant requirement for all switchgear for these applications, in addition to robust construction and adequate load and fault capacity, is that it shall be of minimum size and weight with maximum facilities for installation and operation in confined spaces.

In new buildings there is usually a small room in the basement adjacent to the consumer's intake room so that metering at m.v. is convenient to arrange, and there is preferably separate access from outside the building to ensure adequate ventilation and convenience for inspection or operation purposes in emergency at any time of the day or night. Early contact with the architect is essential on new building projects, and the closest co-operation is maintained throughout to ensure the provision of an adequate site. Enlightened architects welcome and encourage these early discussions and are most willing to provide the necessary accommodation in their designs.

On existing premises all kinds of small spaces are offered, a common type being a disused coal cellar with access through a narrow area or basement passage. These generally require lowering of the floor, underpinning of foundations, re-routing of drains or other services, and possibly reconstruction of the arched roofs. Equipment that requires minimum headroom saves a great deal of money as in the average chamber of this type it will cost at least £100 to lower the floor level by one foot.

Occasionally a completely underground structure may be formed beneath an existing small garden, public square, pavement or highway. The preferred entry in such cases is by combined ventilation shaft and entrance pillar, but where this is unacceptable, pavement or roadway frames and covers are installed for access, with ventilation arrangements disguised as mentioned previously. Outlet ventilators beneath seats although they have been used are not a very good idea as such warm spots become much too popular with vagrants in cold weather.

During the course of years, changes take place in buildings and otherwise good access becomes difficult or even impossible, as in the case of one large store which had so reconstructed its basement that when the time came to change a transformer, the only way out was through the pavement, and this had to be excavated to a sufficient depth to allow the passage of the equipment.

*Top: Work in progress on an area substation. Centre: Existing cables under the footway have to be supported and (foot) interior view of finished chamber*

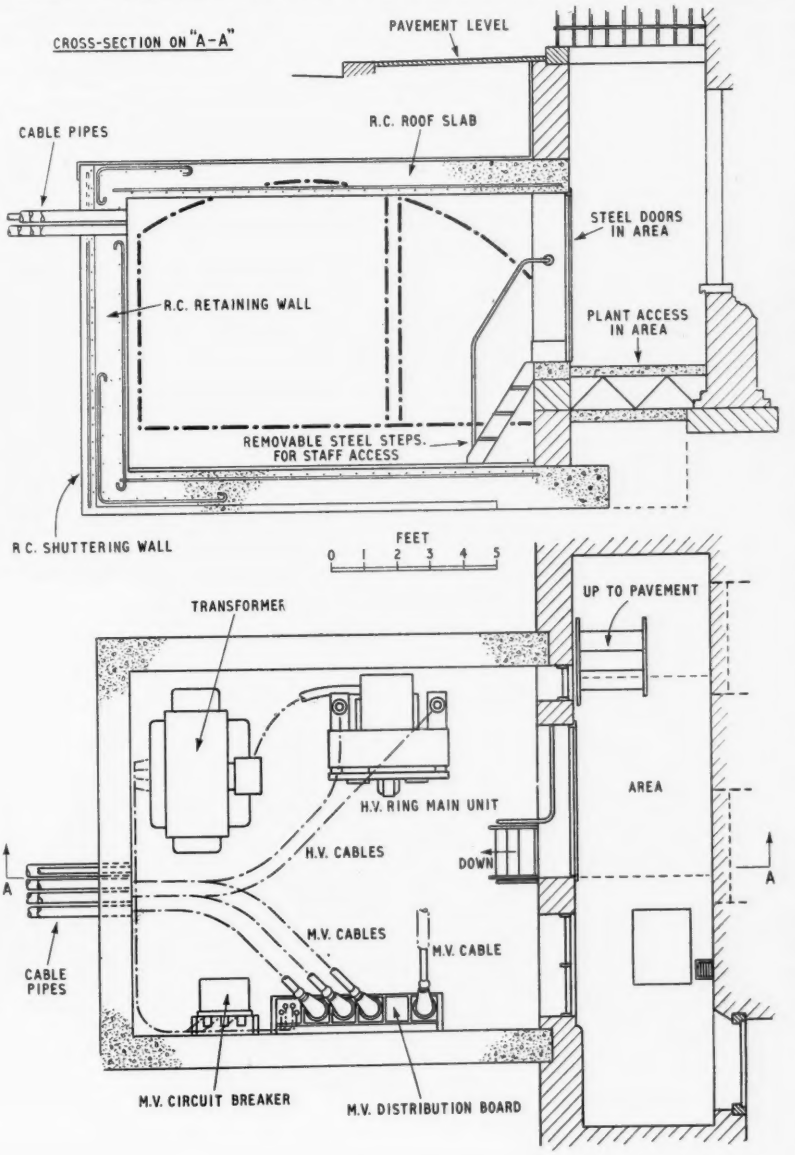
In addition to installations in Government offices, public buildings and places of amusement there are many sites in use in buildings of historic importance—Charterhouse, Lincoln's Inn, Somerset House, the Law Courts, the Houses of Parliament, Buckingham Palace, and many others in which special care has to be taken to prevent damage to the fabric. Frequently, old vaults have to be shored up to take the loads imposed by the passage of a transformer and ancient gateways and passages negotiated most carefully to avoid damage to the fabric—of far more importance than the loss of paint from a mere piece of modern equipment.

The difficulties that are encountered in buildings are matched by those of footway and roadway which impede the running of cables. It is, for example, difficult and expensive in this crowded area to lay any cable direct, and duct systems are used everywhere.

The number of obstructions to be met in some of these thoroughfares has no parallel elsewhere; there are ancient sewers and vaults to be avoided as well as the usual gas, water, and telephone mains, all on a scale greater than any other city; there are special hydraulic mains used for lift operation—the London Hydraulic Power Co. has many miles of these, and there are oddities of historic interest, not all connected with Mithras, but which nevertheless delay operations. For example, it is quite common to excavate old wooden water mains as has been done recently in Lincoln's Inn Fields, and to come across ancient burial grounds—the mains gangs can tell of dozens of places from plague pits to abandoned churchyards where such finds are common and inevitably produce inquiry and delay. Disused and abandoned pipes are a special problem as it has to be ascertained that they are not to be re-used before they can be cut, damaged or removed.

Police regulations, on account of the high traffic density, are particularly onerous, especially in the City. It is only possible to work in main streets at week-ends and during statutory holidays and except in the direst emergency one month's notice must be given to the police as well as to the usual highway authority and other utilities.

*Arrangement of a distribution substation in a disused area coal cellar. The heavy dotted line indicates the original dimensions, the cellar also being arched in the direction of the pavement*




Also to be considered is interference with work caused by public processions by royalty, or similar events such as the Lord Mayor's Show. For some time before these all work must cease and apparatus be removed from the route so that there can be long interruptions to work. It is not generally appreciated how much preparation goes into the arrangement of these procession routes—many seemingly permanent bollards and lamp columns, for instance, are removed to leave a clear road.

In the letter to the London County Council from the Minister of Housing and Local Government giving approval to the London Development Plan there occurs this passage: "At the root of almost all London's planning problems is the evil of congestion and its effects upon living, working and travelling conditions." It could be added that the special difficulties of electricity supply arise from the same source. The concentration in the central area of so much commercial activity results inevitably in the congestion of building sites, of space in buildings, of roadways and footways, of daytime population and its movement by road or rail. It is to overcome those difficulties which apply peculiarly to the Metropolis, that the London Board has developed the special methods and equipment described.

The writer is indebted to the London Electricity Board for permission to publish this article, and to the chief engineer, Mr. L. H. Welch, and a number of colleagues for their assistance and advice.

# Transformer and Protective Gear Circu

*Phasing and Connections of Systems Analysed by Symmetrical Components*

By A. S

PROBLEMS of protective gear connections and phasing of current, voltage, and power transformers are generally solved by application of three-phase balanced vector diagrams.[1] However, the employment of vectors for solving difficult problems such as differential protective circuits, phasing of transformer feeders and complex loop circuits may lead to erroneous connections.

These problems or any other phasing problems can be solved by a method which by-passes the three-phase vector diagram. Introduced by R. Bruce Shipley[2] and based on symmetrical components, it is simpler in use than these diagrams. It is appropriate to call this method of phasing the " single-phase method " because single-phase currents are used for establishing connections of transformers and protective gear circuits.

Symmetrical components prove not only a powerful tool for evaluating currents and voltages under various system fault conditions but also afford means of establishing correct connections for the protective gear systems, particularly for circuits with interposed transformers having an angular phase shift between primary and secondary currents; and also means for checking the phasing of circuits in power transmission systems.

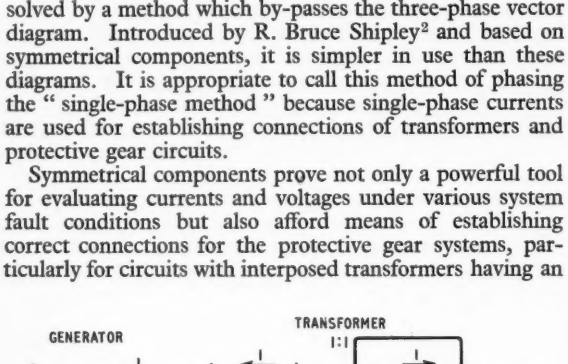



*Fig. 1.—Single line-to-earth fault fed from a generator with insulated neutral*

Generally the magnitude of the line currents has little value for solving phasing problems. It is the relative magnitude and direction of currents flowing in the three phases which determine correct connections. Let us consider a three-phase system with a line-to-earth fault and assume that the three-phase load current is small compared with the fault current (which is usual). It is obvious that if the currents are co-phasal (single-phase) throughout the system, they can be added or subtracted arithmetically at the junction points. Thus in the circuit shown in Fig. 1 if we assume an arbitrary current flowing in the blue phase from the primary winding of the transformer towards the fault " F " all the single-phase currents at any part of the system are fixed in magnitude and direction, provided that (1) transformer polarity is correct, (2) magnetic balance between the primary and secondary windings is observed and (3) Kirchhoff's law is satisfied at any junction point. For the transformer shown in Fig. 1 having subtractive polarity which is standard practice in this country and with winding ratio 1 : 1 the first condition is fulfilled if the current enters say terminal $A_1$ on the primary winding, and leaves the corresponding terminal $a_1$ on the secondary winding; hence primary and secondary currents are equal but reverse in direction. The same applies to the yellow and blue phases. The second condition is fulfilled if the ampere-turns on both sides are equal and finally the last condition if Kirchhoff's law at the two star points and the fault position " F " is satisfied.

Let us select arbitrarily a current I = 1A flowing in the faulty phase from the primary winding towards the fault " F ". In the corresponding limb of the delta winding and of course through the remaining windings of the closed delta the flow is I also but in the reverse direction. Due to the magnetic balance and winding ratio 1 : 1, single-phase currents of the magnitude I = 1A will appear in the primary windings of the two sound phases. Applying Kirchhoff's law to the junction points of the circuits, a single-phase current of the magnitude I = 2A flows in the faulty phase from the generator towards the fault and a current I = 3A from the fault " F " via the fault path towards the star point of the transformer.

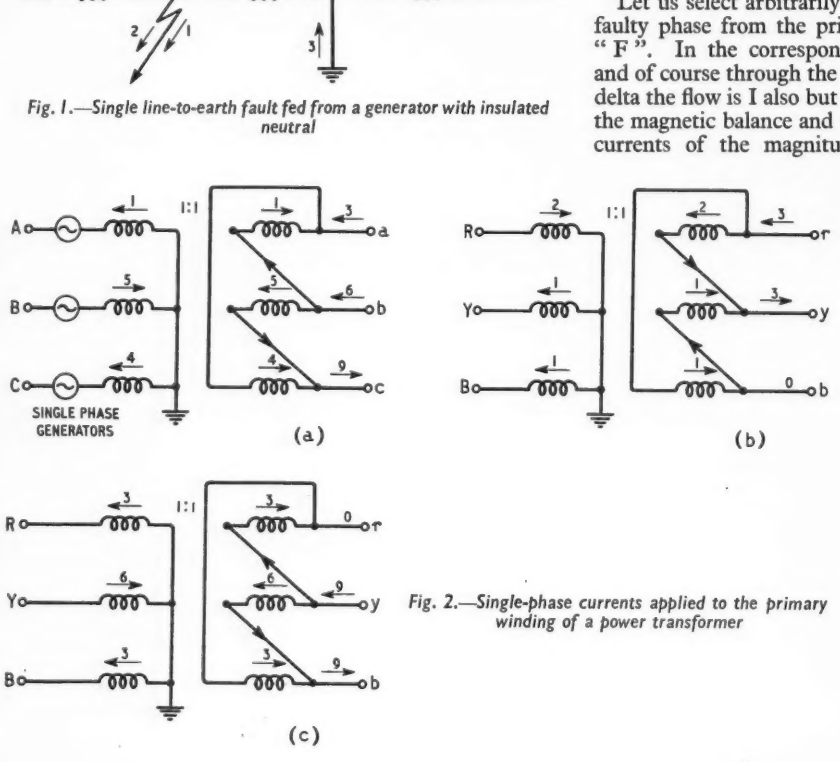



*Fig. 2.—Single-phase currents applied to the primary winding of a power transformer*

The proof that the line currents are co-phasal can be established as follows. According to the theory of symmetrical components zero sequence currents can flow in the system only from and to a point of the earthed neutral of the source of supply or earthed star point of the power transformer. We realize that left of the fault in the circuit Fig. 1 the zero

# Circuit Analysis

By A. SALZMANN, Dipl.Ing., A.M.I.E.E.

phase sequence current cannot flow out from the generator, because its neutral is isolated, hence this section has infinite zero sequence impedance and only positive and negative sequence currents are present.

Considering the section right of the fault, we notice that due to the absence of the source of power to the right of the fault positive and negative sequence impedances are infinite and only zero sequence currents produced by the transformer present. Thus the conditions left of the fault are $I_{R_0} = 0$ and $I_{R_1} = I_{R_2}$ (assuming positive and negative sequence impedances are equal and non-inductive), while on the right $I_{R_1} = I_{R_2} = O$ and $I_{R_0} =//= O$. Applying the basic equations of symmetrical components:—

$$I_R = I_{R_1} + I_{R_2} + I_{R_0} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$
$$I_Y = I_{R_0} + a^2 I_{R_1} + a I_{R_2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$
$$I_B = I_{R_0} + a I_{R_1} + a^2 I_{R_2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$
$$I_{RO} = 1/3 (I_R + I_Y + I_B) \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$
$$I_{R_1} = 1/3 (I_R + a I_Y + a^2 I_B) \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$
$$I_{R_2} = 1/3 (I_R + a^2 I_Y + a I_B) \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

where $I_R$; $I_Y$; $I_B$ are line currents, $I_{R_0}$; $I_{R_1}$; $I_{R_2}$ sequence components and a; $a^2$ are vector operators, we can evaluate the line currents as follows, right of the fault:

Red phase $I_R = 0 + 0 + I_{R_0} = 1A$;
Yellow phase $I_Y = 0 + 0 + I_{R_0} = 1A$;
Blue phase $I_B = 0 + 0 + I_{R_0} = 1A$.

Thus the line currents are equal in magnitude, single phase in ratio 1 : 1 : 1 and co-phasal and can therefore be added arithmetically at the neutral point where $(I_R + I_Y + I_B) = I = 3A$. Left of the fault we have:

Red phase $I_R = I_{R_1} + I_{R_2} + O = 2 I_{R_1} = 2A$;
Yellow phase $I_Y = I_{R_0} + a^2 I_{R_1} + a I_{R_2} = 1 (a^2 + a) + 0 = -1A$;
Blue phase $I_B = I_{R_0} + a I_{R_1} + a^2 I_{R_2} = 1 (a + a^2) + 0 = -1A$.

Here again the line currents are co-phasal, contain only positive and negative sequence components, are single phase in ratio 1 : 1 : 2 and add up to zero:

$(I_R + I_Y + I_B = 2 I_{R_1} - I_{R_1} - I_{R_1} = O)$

Thus the single-phase current caused by fault "F" is the result of two sets of balanced sequence currents. Conversely the application of single-phase currents is equivalent to analysing the circuit with several sets of balanced sequence currents.

As an illustration let us consider the circuit shown in Fig. 2a. Assign a set of single-phase currents say in the ratio 1 : 5 : 4 to the star side of the transformer. This set of single-phase currents is equivalent to analysing the circuit with two sets of balanced currents containing positive and negative components as shown in Fig. 2b and Fig. 2c. The sequence currents in terms of the line currents are derived as follows:

Circuit Fig. 2b—

$$I_{R_0} = 1/3 (2 - 1 - 1) = O$$
$$I_{R_1} = 1/3 [2 + (-\tfrac{1}{2} + j\,0{\cdot}866) (-1)] + (-\tfrac{1}{2} - j\,0{\cdot}866) (-1) = 1A$$
$$I_{R_2} = 1/3 [2 + (-\tfrac{1}{2} - j\,0{\cdot}866) (-1)] + (-\tfrac{1}{2} + j\,0{\cdot}866) (-1) = 1A$$

Circuit Fig. 2c—

$$I^1_{R_1} = -1{\cdot}5 + j\,2{\cdot}598\ A;$$
$$I^1_{R_2} = -1{\cdot}5 - j\,2{\cdot}598\ A;$$
$$I^1_{R_0} = O$$

As a check: Single-phase line currents Fig. 2a—

$$I_R = I_{R_1} + I^1_{R_1} + I_{R_2} + I^1_{R_2} = -1A$$
$$I_Y = a^2 (I_{R_1} + I^1_{R_1}) + a (I_{R_2} + I^1_{R_2}) = 5A$$
$$I_B = a (I_{R_1} + I^1_{R_1}) + a^2 (I_{R_2} + I^1_{R_2}) = -4A$$

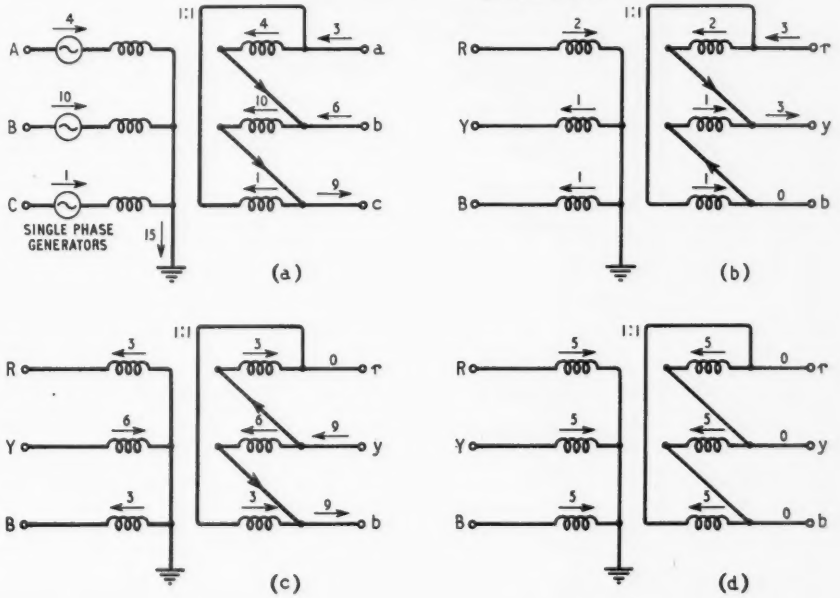
which agrees with the arbitrarily selected currents.

Thus these currents are single-phase currents and can be added or subtracted arithmetically at any junction point according to their relative directions. It follows further that any set of single-phase currents that add up to zero contain positive and negative sequence components only.

In a similar manner we can prove that the assigned set of single-phase currents to the star side of the transformer shown in Fig. 3a contains positive, negative and zero sequence components and is equivalent to analysing the circuit with two sets of balanced currents containing positive and negative sequence components as illustrated in Fig. 3b and 3c and one set containing only zero sequence currents (see Fig. 3d). We notice that two single-phase currents on the star side of the power transformer, combined, do not give the third one; consequently a set of single-phase currents that does not add up to zero contains positive, negative and zero sequence components. On the secondary side, the zero sequence component is removed by the star/delta connected transformer, as the sum of the line currents is zero.

In analysing circuits subjected to faults and fed from one source of supply, the application of the single-phase method enables us to establish the relative directions and magnitudes of line currents. The practical value of this method is to have a check during the process of calculation,

*Fig. 3.—Single-phase currents applied to the primary winding of a power transformer*

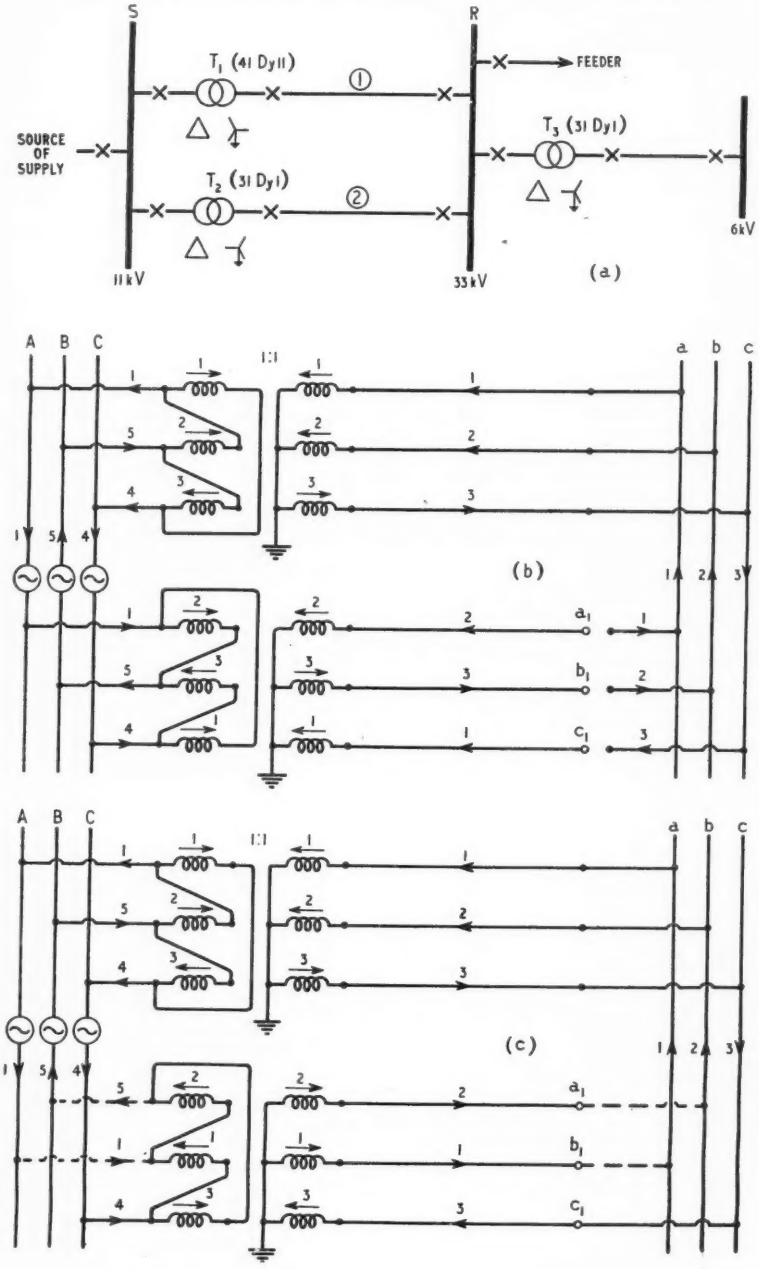


say when determining the actual fault amperes by the method of symmetrical components, particularly when laborious calculations are required. For complex circuits the single-phase method will prove very useful when applying the tensor analysis.

Another practical value of the single-phase method is its application for phasing of circuits. When it is required to determine what points of a circuit should be connected to a network in order to secure correct phasing we have to first assign single-phase currents circulating through the loop circuit under consideration and then map out the relative magnitudes and directions of the currents around the circuit; and if the conditions outlined previously are fulfilled the correct connections of the circuit, as we will see from the practical examples given later, are established.

From Fig. 2a and 3a we notice further that the line currents change in ratio and this is due to the delta connections of the secondary windings. Thus a change in ratio between the currents in any line indicates an angular phase shift between the currents on the actual three-phase power system. For a star/star (B.S.S. 11 Yy O) or delta/delta (B.S.S. 12 Dd O) connected power transformer there is no change in ratio between the line currents, hence the angular phase shift is zero. However, for a star/star (B.S.S. 21 Yy 6) or delta/delta (B.S.S. 22 Dd 6) connected unit, no ratio change will take place either, but the reversal of the currents on the secondary side indicates an angular phase shift of 180 deg.

*Fig. 4.—Diagram of connections of parallel feeders having transformers with angular phase shift*




Let us consider the circuit shown in Fig. 4a, which consists of two transformer feeders (1) and (2), the induced voltages of unit $T_1$ (B.S.S. 41 Dy 11) and $T_2$ (B.S.S. 31 Dy 1) having an angular phase shift of 60 deg. It is required to determine how feeder (2) should be coupled to the busbars at substation "R" in order to secure correct circuit phasing.

The first step is to assign arbitrarily a set of single-phase currents to the primary of the transformer $T_1$ (see Fig. 4b), permitted to circulate between the two circuits to be paralleled. According to Fig. 2a the single-phase currents consist of two sets of positive and negative sequence components. From the inspection of the circuit we realize that conditions (1) and (2) are met but condition (3), the application of Kirchhoff's law to the junction point at "R," is not satisfied.

This is indicated by the reversed set of currents flowing in feeder (2) towards busbars a, b, c. No combination of connections between the terminals $a_1$, $b_1$, $c_1$, and busbars a, b, c will yield correct phasing —an obvious result, because of the angular phase shift of delta/star connected transformers. However, correct phasing is established as illustrated in Fig. 4b by dotted lines if two of the phases both on the primary and secondary sides are interchanged. Alternatively, altering the interconnections of the star or delta windings of either unit will secure correct phasing of both transformer feeders.

As a further illustration let us consider the loop circuit shown in Fig. 5a. It is required to establish the correct connections of the transformer feeder (2) to the busbars at location "R."

Generally correct phasing is secured if the product of the transformer ratios around the closed loop circuit is unity and the sum of the angular phase shifts around the closed loop circuit is zero. Here again it is more simple to complete the circuit to the busbars at "R" by application of the single-phase method than by using the three-phase balanced vector method.

We can prove in a similar manner as shown in Fig. 2a, b, and c that the selected set of single-phase currents contains only positive and negative sequence components and is equivalent to analysing the circuit with three sets of balanced sequence currents (− 6): (+ 3): (+ 3); (− 2): (+ 1): (+ 1); (− 1): (− 1): (+ 2). Tracing the currents through the closed loop circuit, proper phasing is established if the circuit is completed as follows:

Connect terminal $a_1$ to the busbar c;

Connect terminal $b_1$ to the busbar a;

Connect terminal $c_1$ to the busbar b.

The proof can be established as follows:—It was pointed out earlier that a change in ratio between the currents in any line with an interposed delta/star connected transformer indicates an angular phase shift between the currents on the actual three-phase system. We notice that the currents 9, 3, 6, in feeder (1) are changed to 1, 2, 3, on the star side of the unit $T_3$ and this change in ratio between the currents in each line indicates an angular phase shift between the currents on the actual three-phase power system. Considering feeder (2) we see that no ratio change, consequently no angular phase shift, takes place.

Comparing both sets of currents at location " R," feeder (1) 1, 2, 3, and feeder (2) 9, 3, 6, we realize that an angular phase shift between the currents on the actual three-phase power system still exists. However, interchanging the leads of feeder (2) to the busbars " R " as shown in Fig. 5b will yield currents 3, 6, 9, to be compared with currents 1, 2, 3. It is obvious both sets of single-phase currents cannot be identical because the currents in feeder (1) are transformed twice, via $\triangle/\lambda$ and $\triangle/\lambda$ units, but in feeder (2) only once. However, since one set of currents 1, 2, 3,

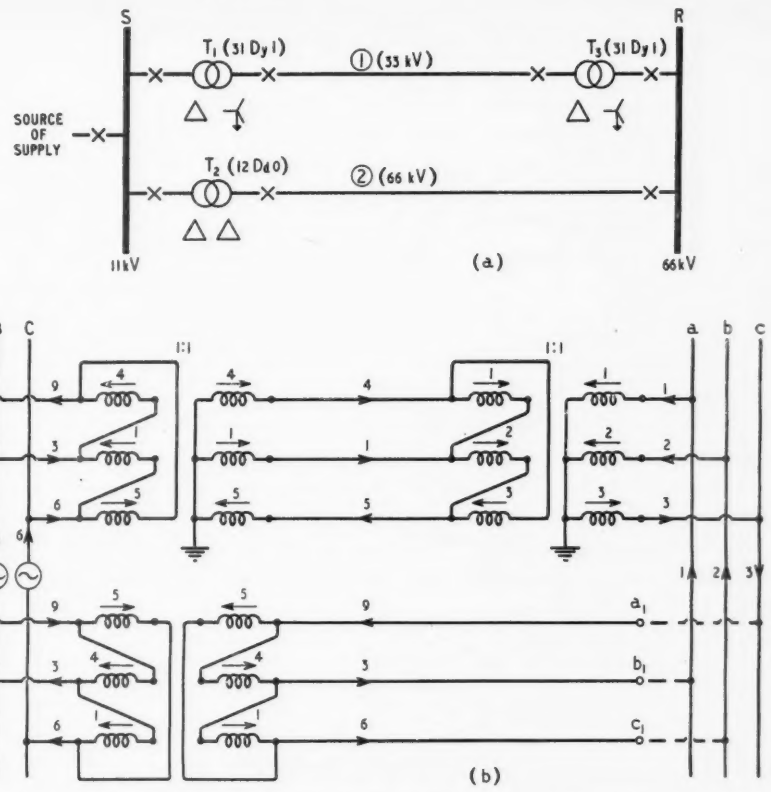
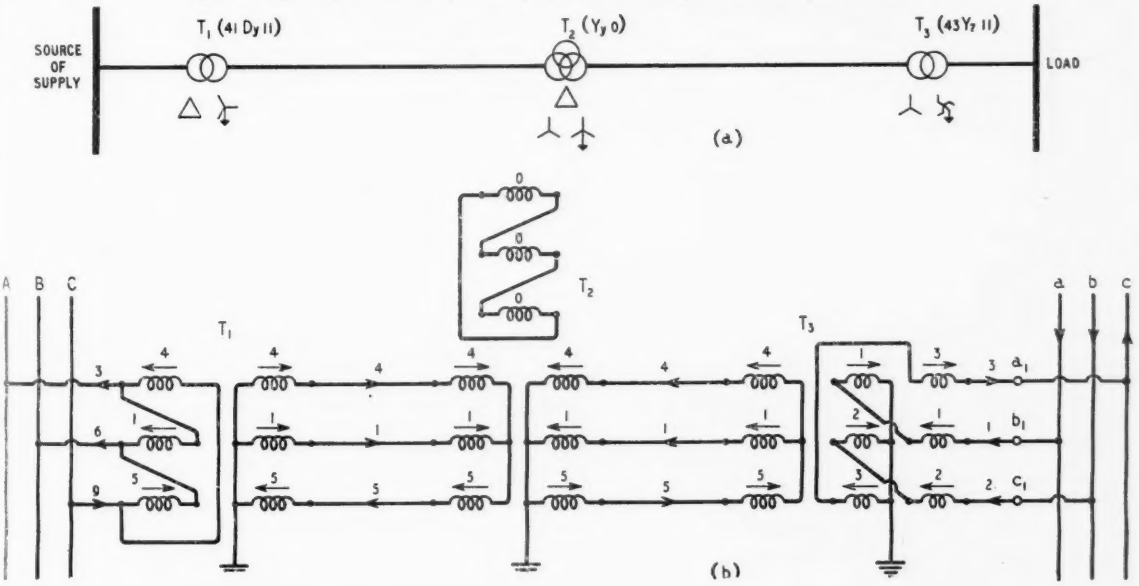



*Fig. 5.—Diagram of connections of a ring main system having transformers with angular phase shift*

*Fig. 6.—Diagram of connections of a three-phase transmission system with interposed transformers*



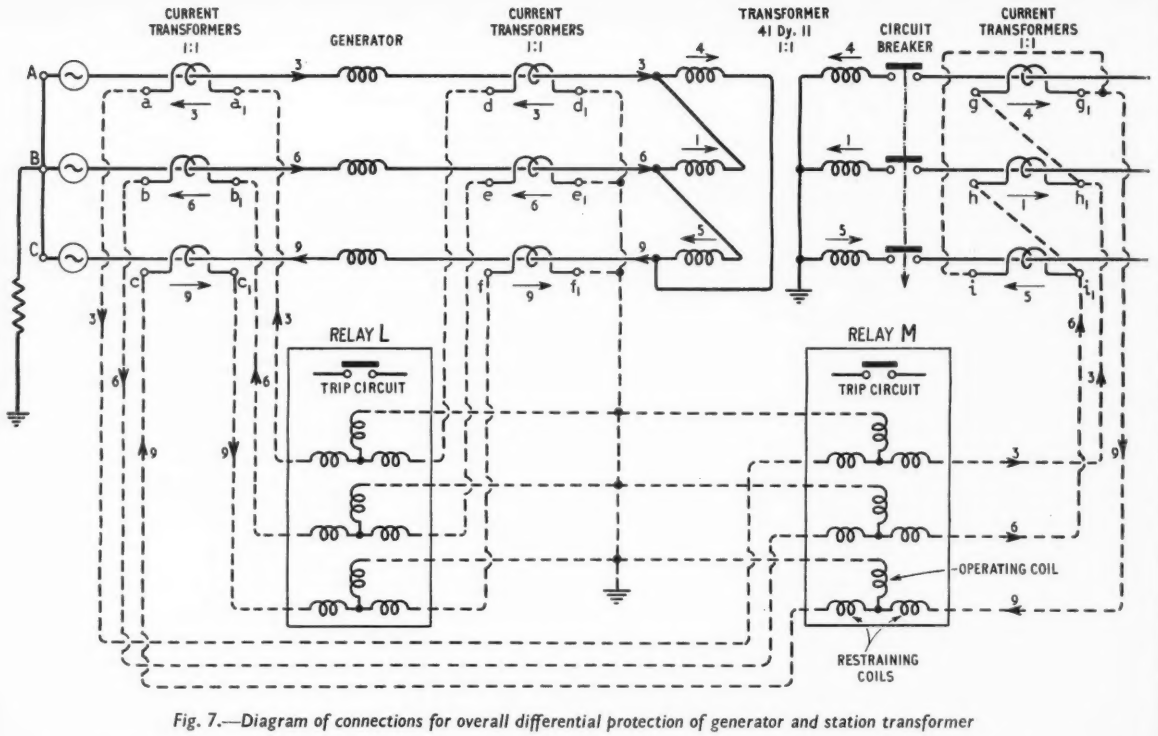



*Fig. 7.—Diagram of connections for overall differential protection of generator and station transformer*

can be changed by multiplying it by a constant " 3 " to be equal to the other, currents on the actual three-phase power system are in phase, the angular phase shift is zero and correct phasing of feeder (2) is secured.

As a final illustration, let us consider a network consisting of a chain of power transformers shown in Fig. 6. From the interconnection of the windings we can derive according to B.S. the angular phase shift introduced by each unit. For the unit $T_1$ the angular phase shift is + 30 deg; for the unit $T_2$ the phase shift is zero and for transformer $T_3$ is + 30 deg; thus the total angular phase displacement at the remote end of the transmission line referred to the primary of the first unit is + 60 deg. It is required to establish the correct transformer connections, so that the applied voltage to the primary of unit $T_1$ is exactly in phase with the output voltage $T_3$ in order to connect back the system to the source of power. (Loop circuit.)

Applying the principle of the single-phase method as outlined earlier correct connections are established if the circuit is completed as follows:

Connect terminal $a_1$ to the busbar c (see Fig. 6b);
Connect terminal $b_1$ to the busbar a;
Connect terminal $c_1$ to the busbar b.

As a last case, the circuit shown in Fig. 7 represents the overall differential protection of a generator and station transformer. Relay (L) provides sensitive protection for generator-winding faults, while relay (M) gives overall protection to the generator, transformer and circuit-breaker. It is obvious that nine current transformers must be provided for overall differential protection of the circuit.

Our task is to determine the connections between the current transformers (dotted lines) so that no current flows in the operating coils of the protective relays in the event of an external fault of any type. Applying the single-phase method, we assign a set of single-phase currents 9, 6, 3, to the primary windings of the power transformer. The interconnection of the current transformers via the restraining coils of the relays (L) and (M) is completed correctly if these single-phase currents do not circulate in the operating coils of the relays.

Applying Kirchhoff's law to the junction points after mapping out the relative magnitudes and directions of the currents in the circuit diagram, the current distribution can be established as follows:—

For generator protection we require single-phase currents 9, 6, 3, to circulate in the pilot wires via restraining coils and by-pass the operating coils of the relay (L). The connections at the CT terminals are therefore ($a_1$) with (d), ($b_1$) with (e) and ($c_1$) with (f). For overall differential protection we have to combine on the star side of the power transformer currents I = 4A and I = 5A equal to I = 9A to circulate with the current I = 9A on the generator side, hence we have to connect terminal ($g_1$) with (i) and ($g_1$) with terminal (c) via restraining coils of the relay (M). Similarly we have to combine currents I = 5A and I = 1A on the star side of the power transformer to circulate with I = 6A on the generator side, and also we have to connect ($i_1$) with (h) and ($i_1$) with terminal (b). It is obvious that the other connections are automatically established. We have to connect terminal (g) with ($h_1$) and ($h_1$) with (a).

As a check let us assume a line-to-earth fault on any phase of the three-phase system, say on the red phase (the outgoing side of the generator). Both relays (L) and (M) must be operative if the connections are correct. A fault on the star side of the transformer will cause only relay (M) to operate while relay (L) will restrain due to the fact that the fault is outside the protective zone of the generator. For a fault outside the overall protective zone both relays should remain inoperative.

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2. R. Bruce Shipley: "Tensor and Transformer Connections." *Allis-Chalmers Electrical Review*, No. 2, 1954.

# Mains Frequency Induction Furnaces

## NEW RANGE OF UNITS PRODUCED BY BIRLEC

THE principle of induction melting has been well established for over 30 years and many examples of this melting method are in everyday service all over the world. Broadly speaking, two types of induction melting furnace are available. One uses a coil fed with a.c. at normal range frequency and an iron core to concentrate the induced magnetic field. This field passes through part of the furnace charge (usually arranged to form a closed metallic loop) which therefore acts as a short-circuited secondary winding of a transformer carrying a heavy induced current. This type of furnace is usually known as a channel-type induction melting furnace.

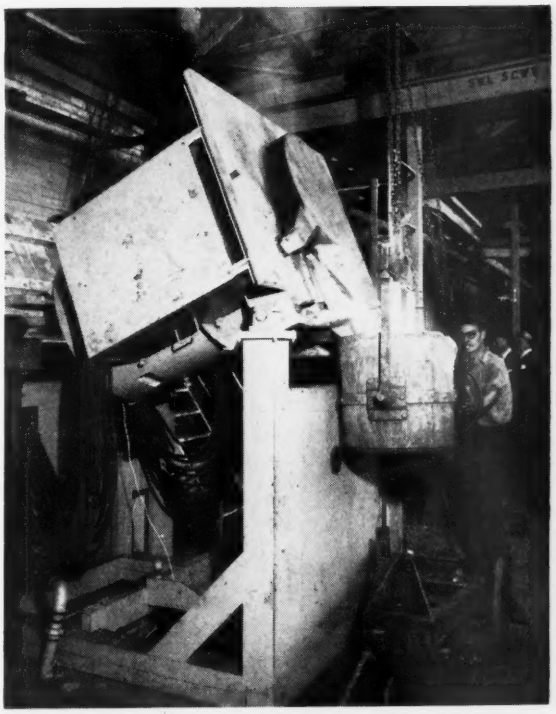
The other type of furnace also uses an inductor coil but it surrounds the complete metal charge. The coil is energized by a.c. at between 400 and 10,000 c/s and the resultant magnetic field induces heavy eddy currents in the charging causing it to be rapidly heated to melting point and beyond. With this type of furnace it is necessary to provide means for converting the available 50 c/s supply to the required frequency and since the electrical coupling between the coil and charge is loose, a bank of capacitors must be provided to improve the power factor of the furnace, which results in an increase in the capital cost.

Birlec, Ltd., has developed a coreless induction melting furnace operating at mains frequency thus combining some of the advantages of both the channel type and high-frequency coreless induction melting furnaces.

On Thursday of last week a lecture on the new furnace was delivered in London before some 200 users and potential users of this type of equipment by Mr. F. S. Leigh (Birlec) and Dr. K. Scherzer of Junker G.m.b.H., Germany. Mr. Leigh dealt with the theoretical background and practical design features while Dr. Scherzer discussed furnace operation mainly from the metallurgical point of view.

Development work on the mains frequency coreless induction furnace by Birlec began about two years ago. Similar furnaces had been developed in Germany by Otto Junker shortly after the end of the war. In the post-war period Junker's installed many such features and favourable reports concerning their operation were received in this country. Birlec subsequently decided to make an experimental production unit of 15/18 cwt capacity and rated at 250 kW. It was known that independent development work on similar furnaces was simultaneously carried out by the Ajax Engineering Corporation, Trenton, New Jersey. Ajax and Birlec had collaborated for many years on the production of the "Tama" channel-type furnace and latterly Ajax had also negotiated with Junker for its manufacture in Germany. Subsequently, an agreement was made between the three companies whereby mains frequency coreless induction furnaces could jointly be developed and marketed.

The new Birlec mains frequency furnaces are available in six sizes ranging from 15 cwt to 5 tons with ratings varying from 125 kW to 1,000 kW and are designed on the same lines as conventional high-frequency furnaces, although the inherent electrical characteristics of the mains frequency equipment make it essential for certain design and operating principles to be observed. For instance, it can only be started from cold if the initial charge is made up of pieces of a certain minimum size, depending upon the type of metal being melted. However, once started this furnace operates in practically the same manner as a normal high-frequency furnace and deals with any size of material. Owing to the vigorous stirring action inside the molten bath it is particularly suitable for dealing with fine particles such as cast iron borings, swarf, etc.



*Birlec mains frequency coreless melting furnace, having a capacity of 18 cwt and rated at 250 kW, pouring high quality iron melted from borings*

## Low-Temperature Metallurgy

IN order to bring to the attention of metallurgists aspects of a recent conference in Paris relating to low-temperature metallurgy, the Metal Physics Committee of the Institute of Metals has arranged a meeting to be held in London. After a short introduction by Sir Francis Simon, C.B.E., F.R.S., professor of thermodynamics at the Clarendon Laboratory, Oxford, explaining why low temperatures are becoming of increasing importance to the metallurgist, Dr. P. L. Smith and Dr. H. M. Rosenberg also of the Clarendon Laboratory, will make individual reports on the recent Paris Conference. The speakers will review some of the work on thermal and electrical conductivity, the specific heats of metals, and some of the mechanical properties at low temperatures (e.g. internal friction, elastic properties, fatigue, etc.). The meeting will be held at 4, Grosvenor Gardens, London, S.W.1, on Wednesday, 7th December, at 6.30 p.m. and visitors will be welcome without tickets of admission.

# PARLIAMENTARY REPORT

INTRODUCING his Supplementary Budget last week, Mr. R. A. Butler, the Chancellor of the Exchequer, referred to the action taken by the Central Electricity Authority to reduce capital expenditure. He said that the Authority had asked the Electricity Boards for an all-round percentage cut in their expenditure in the current year, and even in the field of generation, which had priority, they had been able to postpone certain less vital projects while pressing on urgently with the nuclear power programme.

The Chancellor said that in both the gas and electricity industries promotional expenditure was being cut back. Working capital employed in hire-purchase activities, and stocks held for those activities, had been curtailed as a result of the Boards' own efforts and the Government restrictions on hire purchase. These initial measures would produce some useful savings in this year's capital expenditure but it was only in the period ahead that substantial changes could be made. For that period the nationalized industries had been carrying out a more detailed survey of capital projects as well as of internal resources, the results of which would be incorporated in the investment programmes they were about to submit to the Government. These were submitted every year, but the industries were fully conscious that on this occasion their proposals for future investment would necessarily be examined with a much more critical eye than in previous years.

This examination was not confined to gas and electricity; the National Coal Board was pursuing the possibility of some saving by deferring projects such as brickworks and office buildings which did not affect output. The modernization and re-equipment of British Railways was at an early stage and did not yet involve any substantially increased demand on labour and resources, but the Transport Commission was well aware of the general needs of the economy and in carrying through its programme would have them in mind.

It was the Government's intention to set an example of restraint and it was in this spirit that adjustments had been made in the investment requirements of the Post Office. He was sorry that it would not be possible for the Postmaster-General to reduce the size of the telephone waiting list quite as quickly as the Government would have liked, but they would do all they could. It had also been necessary to make changes in telephone charges and tariffs which would produce an extra £26 million a year.

## The Battle for Exports

In the debate which followed the Budget speech, Mr. Eric Johnson and Squadron-Leader Cooper both asked the Chancellor, in his efforts to encourage more exports, to give tax concessions for export business. Squadron-Leader Cooper said it was not generally realized what tough battles had to be fought by British companies to secure extra business in foreign markets; the enormous amount of work which had to be put in before any sort of reward came was not recognized. Industry had to accept orders in most countries at substantially lower prices than they generally quoted. He said that there had been several crises of the present kind since 1945 and successive Chancellors had offered the same medicine —restriction in home demand in order to encourage more goods into the export markets. Each time it succeeded temporarily then, after a few months, we found ourselves in the same difficulties again. It seemed to him, therefore, that Parliament must seriously consider whether this policy, coupled with excessively high taxation, was the right way to tackle our problems. It must be the prime duty of the Government to ensure that money retained its value over a long period; people did not save to-day because they saw the value of their savings steadily decreasing. Purchase tax was a vicious and stupid tax which might be justified in war but not in peacetime. He would prefer to see a sales tax, operated as it was in the United States.

## Effect on Clean Air Campaign

Mrs. Lena Jeger said the cutting down of capital expenditure in the gas and electricity industries was very unfortunate at a time when the House was much concerned about smoke pollution, not only because of the more efficient working there could be with better equipment in those industries but because our scientists had discovered how to deal with emissions from power stations. These things cost money. Was the money not to be available for works like these, which everyone agreed were very badly needed? It was not generally realized that we were spending more on advertising than we spent on education; could not the Chancellor consider imposing an advertising tax?

Mr. Gerald Nabarro said that if there was any single cause for the provisions contained in the Budget it was the country's coal position. The Chancellor had said that the overall surplus in the balance of payments earned in the first six months of this year was only £17 million and that this was insufficient for our investment needs overseas and at home. What would he have said had he had available an additional £60 million which was the cost of importing coal so far this year? In fact, practically none of the proposals made in the Budget would have been necessary. Until and unless the Government dealt dramatically with the whole of the fuel and power problem by a coherent and comprehensive programme to link the individual policies of the nationalized fuel and power industries, our coal position would decline, he said, and thus the drain on our balance of payments next year would be even more severe than it had been this year.

The curb on the investment programmes of the nationalized industries did not go nearly far enough. The Chancellor had said that the gas industry was cutting back its investment programme by £3 million—that sum was a very small proportion of the investment programme.

This year State electricity was taking £200 million of new investment. He wanted to see the maximum investment for the provision of industrial power to redress the balance that existed of 2½ to 1 between the United States and this country in their favour, but why was it necessary to spend vast sums of money annually on promotional advertising? The function of the Electricity Boards was to sell electricity, not to compete with private enterprise on what he believed was an unfair, subsidized basis in the sale of electrical appliances because tens of millions of pounds were absorbed by such ventures. It was inflationary. That money should be spent on productive expansion in the generation and distribution of electricity. The same was true of the North of Scotland Hydro-Electric Board and the Gas Boards.

Mr. Cledwyn Hughes said that excellent work had been done in rural electrification in North Wales. Much remained to be done, however, and now it was to be curtailed. This would have a serious effect on the country; agricultural production would suffer, industrial development would be restricted and the incentive to remain on in the countryside and to stop the drift from the land would be lessened. It was a niggardly policy.

Mr. Hugh Gaitskell, who led the Opposition's attack on the Budget, said that Labour did not object to the Government controlling the investment programmes of the nationalized industries but they would not stand for a policy by which cuts were imposed on these industries just because they were nationalized; they happened to be the basic industries on which our future depended. The Opposition wanted to encourage more investment, both private and public; to curtail it would certainly imperil our future productivity. It might be a good thing that the promotional activities of the electricity and gas industries were to be cut, but how did the Government reconcile that with their policy of

actively encouraging promotion through commercial television and why did they limit this restraint to the nationalized industries only?

On purchase tax, Mr. Gaitskell said that there might have been a case for picking out certain items of a luxury character for increased tax so that more luxury goods would be available for export. But the sweeping, indiscriminate increase was bad. It was a thoroughly retrograde step to bring back the tax upon household goods. He suspected that the Chancellor was doing it because he later contemplated converting purchase tax into a general sales tax. This sort of tax was an easy one to collect but it was extremely regressive and he hoped the Chancellor was not contemplating anything of this kind.

Mr. Peter Thorneycroft said that since 1938 the real value of dividends —that was in terms of purchasing power—had sunk by one-third, while the purchasing power of wages and salaries had risen by one-third. That represented a very real transfer of purchasing power. In recent months we had imported coal and steel, which we normally expected to produce here, costing us more than £100 million on our balance of payments.

Mr. Austen Albu said that the effect of the growth of private industries on the consumption of steel, raw materials, gas and electricity would be very serious if they were allowed to expand while the basic industries were to be cut.

Mr. William Whitelaw referred to the unfortunate effect which economic restrictions would have on rural electrification in the north-west. He said that there were still 3,480 farms wanting electricity in the Lakeland Sub-Area alone. In addition there were long waiting lists for telephones in rural areas.

Mr. Harold Wilson said he had heard of a case where negotiations had been going on for eighteen months to secure a large order of nearly £2 million for a great new British engineering development. But the firm had been told by their bankers that the "credit squeeze" would make it difficult to finance the project. This sort of restrictionism was endangering our export trade.

Sir Herbert Butcher said that the changes in purchase tax were a definite disadvantage to industry.

Sir Edward Boyle, Economic Secretary to the Treasury, said that it was not always easy to establish a precise connection but there was an overwhelmingly wide body of opinion which was sure that the increase in purchase tax must result in benefit to our export trade.

## Electricity and Gas Expenditure

In reply to Mr. Nabarro, the Minister of Fuel and Power (Mr. Geoffrey Lloyd) said that in the current financial year the gas and electricity industries, taken together, were reducing their expenditure on advertising by nearly £500,000 which would be available to finance capital investment.

## Coal Stocks

Replying to Mr. Nabarro, Mr. Joynson-Hicks, Parliamentary Secretary, Ministry of Fuel and Power, said that distributed stocks of coal at 15th October totalled 18·6 million tons compared with 16·9 million tons a year before, the higher level of imports more than accounting for the increase. In the first nine months of 1955, 8·7 million tons of coal was imported at a landed cost of £55 million compared with 1·5 million tons costing £9 million in the same months of 1954.

## Tenders for American Contracts

Mr. Grimond asked the President of the Board of Trade what representations had been made to the United States Government over their higher tariffs and refusal of British tenders for electrical contracts.

Mr. Thorneycroft replied that the Government had expressed to the United States Government their grave disappointment at the recent decisions in respect of the contracts for the Chief Joseph Dam, and the increase in the United States tariff on bicycles.

## Overseas Trade Fairs

Mr. Martin Lindsay asked the President of the Board of Trade whether his department would assume responsibility for the success of British displays at the most important overseas trade fairs, in view of the national efforts made by other countries, for example, America and Russia, for purposes of national prestige.

Mr. Low, Minister of State, Board of Trade, replied in the negative. He said that the primary purpose of industrial displays at overseas trade fairs was to sell goods. That was a function of industry and not of government. The Board of Trade provided information stands at a number of overseas fairs and, in addition, at selected fairs arranged small exhibits of various kinds to back up the industrial display. In this matter they had the advice of an Exhibitions Advisory Committee representing industry. The expenditure of public money on overseas trade fairs for purposes of national prestige and not for commercial purposes was a matter for the Secretary of State for Foreign Affairs.

Sir Jocelyn Lucas asked the President of the Board of Trade if he was aware that at the recent St. Erik's Industrial Fair in Stockholm, of the 14 countries officially represented the British exhibit was the smallest, being only 70 square metres, whilst six other countries had between 1,000 and 3,000 sq m, and if he would take steps to encourage a greater British participation on future occasions.

Mr. Low said that at St. Erik's Fair this year goods from more than 100 British firms were displayed in the trade sections in which industry generally considered they could show their goods more effectively. The small Board of Trade stand was an information and inquiry centre and not a national exhibit. While the Board of Trade had always encouraged participation in St. Erik's Fair it was not its policy to spend public funds on national prestige exhibits at this Fair.

## Street Lighting Standardization

Mr. Harold Davies asked the Minister of Transport and Civil Aviation if he would consider drawing the attention of all the authorities concerned to the desirability of standardizing street lighting throughout the urban areas in Great Britain and if he would make a statement.

Mr. Boyd-Carpenter replied that his Department advised lighting authorities, where they were providing new equipment, to adopt the standards of lighting recommended in the Departmental Committee on Street Lighting's reports of 1935 and 1937. The rate of progress must depend on the financial resources of the responsible authorities.

## Television Insurance

Mr. Thorneycroft informed Sir Leslie Plummer that he had no power to regulate the use of the word "insurance" in connection with agreements to maintain television sets. In any case, prohibition of its use would not affect the competence of the firms to carry out their agreements.

## Nuclear Power Station Sites

Answering questions by Mr. H. Hynd and Mr. Hector Hughes on the progress of the £300 million programme of nuclear power development, Mr. Joynson-Hicks said that the C.E.A. had already selected sites for the first two stations. Four more sites were under urgent consideration and the Authority was pressing on with its search for others.

## Power Station Schemes

Mr. Joynson-Hicks, replying to a question by Mr. Pearson, said that after holding a public inquiry and considering all the representations which had been made the Minister of Fuel and Power had decided to grant the Central Electricity Authority's application for permission to build a power station at The Leys, Glamorgan.

The Blyth Generating Station (Ancillary Powers) Bill, which has been passed by the House of Lords, was given a second reading in the Commons last week and has been committed to a Private Bill Committee for further consideration.

## Herbert Committee's Report

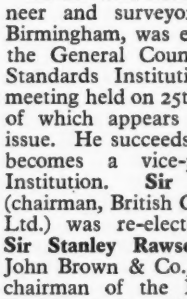
In answer to Mr. Palmer, Mr. Joynson-Hicks said he understood that the Committee, under the chairmanship of Sir Edwin Herbert, investigating the organization of the electricity supply industry, expected to report by the end of the year.

# PERSONAL AND SOCIAL

## *News of Men and Women of the Industry*

**Sir Herbert Manzoni,** C.B.E., engineer and surveyor of the City of Birmingham, was elected chairman of the General Council of the British Standards Institution at the annual meeting held on 25th October, a report of which appears elsewhere in this issue. He succeeds **Mr. J. Ryan,** who becomes a vice-president of the Institution. **Sir Roger Duncalfe** (chairman, British Glues & Chemicals, Ltd.) was re-elected president, and **Sir Stanley Rawson** (vice-chairman, John Brown & Co., Ltd.) was elected chairman of the B.S.I. Engineering Divisional Council, in succession to **Mr. S. J. Harley** (Coventry Gauge & Tool Co., Ltd.).

The recently formed British subsidiary of the Square D Co., the American manufacturers of electrical control gear and switchgear, is to be managed in this country by **Mr. J. L. Thompson,** of Chicago. Mr. Thompson served in this country with the U.S. Forces during the war and was trained by the Royal Artillery in military radar operation. After graduating with a M.Sc. degree from an American university, Mr. Thompson joined the Square D Co. in July, 1940, and has previously held appointments as field engineer and as regional sales manager of the Chicago and Middle West territory. The company's London offices are at 100, Aldersgate Street, E.C.1.



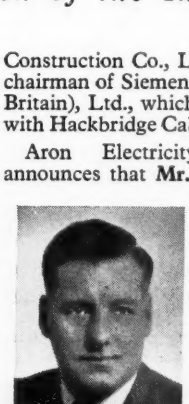
*Mr. J. L. Thompson*

**Mr. R. A. Henderson** and **Mr. J. L. E. Smith** have joined the board of the Solartron Electronic Group, Ltd.

The Minister of Housing and Local Government has appointed **Dr. J. S. Carter,** O.B.E., M.Sc., F.R.I.C., as Chief Inspector of Alkali, etc., Works in succession to **Mr. W. A. Damon,** C.B.E., B.Sc., F.R.I.C., M.I.Chem.E., who is retiring on 4th December next from this position. Mr. Damon will continue with the Ministry in an advisory capacity.

**Mr. William L. Brown** has been elected to the board of Hackbridge Cable Holdings, Ltd., and appointed managing director of the company. He has also been elected to the board and appointed chairman of Hackbridge Cable Co., Ltd., and Bryce Electric Construction Co., Ltd., and appointed chairman of Siemens-Schuckert (Great Britain), Ltd., which are all associated with Hackbridge Cable Holdings, Ltd.

Aron Electricity Meter, Ltd., announces that **Mr. Oswald Freeman,** home sales controller, has resigned and that **Mr. Robert Taylor** has been appointed sales controller in charge of the home and export markets.



*Mr. R. Taylor*

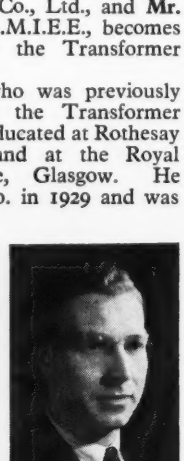
Included among those who were made Honorary Fellows of Imperial College at the Commemoration Day celebrations at the Albert Hall last week was **Sir George Nelson,** chairman and managing director of the English Electric Co., Ltd.

Philips Electrical, Ltd., has appointed **Mr. K. A. Bromley** as marketing manager of its Lighting Division. He will be responsible for co-ordinating the marketing activities of the product groups within the division and will assist branches and regions in giving effect to divisional sales policy. Mr. Bromley joined Philips in 1948 and was branch lighting engineer at Leeds before being transferred to Manchester in 1951 as assistant regional manager, north west region.

**Mr. R. J. Cochran** has been appointed sales manager of the Plant Department of the Metropolitan-Vickers Electrical Co., Ltd., and **Mr. J. Dyson,** B.Sc., A.M.I.E.E., becomes sales manager of the Transformer Department.

Mr. Cochran, who was previously sales manager of the Transformer Department, was educated at Rothesay Academy, Bute, and at the Royal Technical College, Glasgow. He joined the M-V Co. in 1929 and was appointed sales manager of the Transformer Department in 1945.

*Mr. R. J. Cochran*

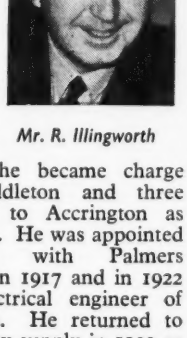


*Mr. J. Dyson*

Mr. Dyson received his technical training at the Halifax Technical College and obtained an external degree from London University. He joined M-V as a college apprentice in 1947, and after a short period of special training, spent some months at the company's office at The Hague. In 1952 he returned to the Transformer Sales Department, and he was appointed assistant to the sales manager of that department in March, 1954.

**Sir Bernard Keen,** D.Sc., F.Inst.P., F.R.S., has been appointed scientific adviser to Baird & Tatlock (London), Ltd. Until recently he was Director of the East African Agriculture and Forestry Research Organization.

**Mr. R. Illingworth,** O.B.E., M.I.E.E., M.I.Mech.E., generation engineer (construction), C.E.A. London Division, retired at the end of October. Mr. Illingworth was educated at Oldham Technical School and Manchester College of Technology and received his training with the Blackpool and Middleton Tramways. In 1912 he became charge engineer at Middleton and three years later went to Accrington as engineer-in-charge. He was appointed engineer-in-charge with Palmers Shipbuilding Co. in 1917 and in 1922 became chief electrical engineer of Cory Bros. & Co. He returned to municipal electricity supply in 1929 as deputy electrical engineer and manager at Plymouth, and in 1932 was appointed chief electrical engineer and manager at Poplar, which position he held at vesting date.



*Mr. R. Illingworth*

**Mr. M. J. Amberg,** sales engineer with the Express Lift Co., Ltd., has left for Rome where he will take part in the World Fencing Championships as one of a team of five representing England. He will take part in the contests both as a member of the team and in individual meetings with other competitors for world championships. In all contests he will fight as a sabreur.

Two ladies on the staff of W. T. Henley's Telegraph Works Co., Ltd., recently completed forty years' service with the company. **Miss K. E. Gilbert,**

who has now retired, served as secretary to three of the company's chairmen—Sir George Sutton, Mr. A. E. Salmon and Sir Montague Hughman. **Miss E. M. Bright** has served in a number of capacities and is now in charge of the company's Mailing Department. The two ladies have each received a framed resolution from the board recording its appreciation of their service, together with savings certificates.

**Mr. W. S. Sawtell,** M.I.E.E., is retiring from the position of full-time member of the South of Scotland Electricity Board on 31st December. By then he will have served the electricity supply industry for nearly fifty years. For a number of years he was with Dundee Corporation and in 1923 he became general manager of the Scottish Southern Electricity Supply Co. and later of the Fife Electric Power Co. On the nationalization of the electricity supply industry he was appointed deputy chairman of the South East Scotland Electricity Board.

*Mr. W. S. Sawtell*

After more than forty-four years' service with the British Thomson-Houston Co., Ltd., **Mr. N. E. W. Sloan,** of the motor engineering staff, has retired. Mr. Sloan joined the B.T.H. Co. at Rugby in 1911 from the Royal College of Science, Dublin. He worked first in the electrical laboratory and the Testing Department before entering what was then known as the D.C. Engineering Department. During the 1914-18 war he served overseas in the Irish Fusiliers and the Machine Gun Corps. In recent years Mr. Sloan has specialized in the design of d.c. motors and generators for electric navvies, excavators and ore bridges, and has done much valuable development work in this field.

**Mr. H. V. Potter,** who, as we reported in our 9th September issue, has retired from the position of managing director of Bakelite, Ltd., was the guest at a party held at Grosvenor House, London, on 31st October which was attended by twenty-five people, drawn from all grades of employees. After a private luncheon, Mr. Potter was presented with a silver salver from the company's 3,000 employees by Mr. C. C. Last, a director. Mr. G. W. Hodds, who succeeds Mr. Potter as managing director, said that Mr. Potter had been with the company and its predecessors for over forty years. Mr. Potter also received an illuminated album in which all employees of the company had signed their names. A few days previously he was the guest of his fellow-directors at a private luncheon at the Savoy Hotel. During the luncheon Mr. P. Huffman, vice-chairman of Bakelite, Ltd., presented him with a television set on behalf of the board and said how much they valued his decision to continue as chairman.

On Friday last week the **London Electricity Board** Headquarters Local Advisory Committee held a dinner and dance at the Strand Corner House, London, when Mr. H. C. Spence, M.I.E.E., deputy chief engineer, London Electricity Board, took the chair and there were about 400 seated.

It was essentially a social affair with very few speeches, which were brief and jovial in tone. In proposing "The President," Mr. E. J. H. Francis, vice-chairman of the Advisory Committee, said that this was probably the last time that all present would be together again in view of the pending retirement of Mr. Spence. Mr. Spence proposed "The Guests" and said that he was particularly pleased to see so many present from the sub-areas and districts. This toast was responded to by Mr. A. Morton Gore, secretary of the London Electricity Board.

**Mr. S. D. Larcombe,** A.M.I.E.E., sub-area engineer (mains), No. 2 Sub-Area, North Western Electricity Board, retired on 8th October after forty-eight years' service in the electricity supply industry. Mr. Larcombe commenced his career at Hastings and later joined the staff of the North Metropolitan Electric Supply Co. After a period with the Yorkshire Electric Power Co. he joined the Mains Department staff of the Lancashire Electric Power Co. in 1912. In the early part of 1920 he was appointed deputy mains superintendent, which position he held until the end of 1945 when, on the reorganization of the staff of the company, he was appointed mains superintendent. At vesting date he was appointed to the position from which he has now retired. Mr. Larcombe was responsible for original developments in connection with 11 and 33 kV overhead transmission. On his retirement he was presented with a console model television receiver by his present and past colleagues and also a pen and pencil set for Mrs. Larcombe. A dinner was held in his honour at the Pack Horse Hotel, Bolton, on 11th October, at which his old colleagues and manufacturers' representatives were present. Mr. Larcombe was presented with an illuminated table plan which depicted the development of the electricity supply industry. He was also presented with a bouquet for Mrs. Larcombe, and a Stilton cheese.

After fifty-two years with C. A. Parsons & Co., Ltd., **Mr. R. H. Smith,** foundry manager, has retired, and has been presented with a television set by Sir Claude D. Gibb, chairman of the company.

The only way in which the majority of the population could achieve greater happiness and contentment lay in developing pride in craftsmanship and pride in production, suggested Mr. R. A. Marryat, president of the **Electrical Contractors' Association,** speaking at the recent annual dinner-dance of the Leicester Branch of the Association. He said that although there was so much that electricity could do to improve living and working conditions, it could not,

*Presentation to Mr. S. D. Larcombe, showing left to right: Mr. W. Phœnix (sub-area secretary, N.W.E.B.), Mr. O. Howarth (late chief engineer), Mr. W. D. Sutcliffe (sub-area engineer), Mr. Larcombe, Mr. R. C. Leslie (late manager, No. 2 Sub-Area, behind Mr. Larcombe), Miss E. R. Hammond (sub-area accountant's staff), Mr. S. M. Rix (deputy chairman, Southern Electricity Board), Mr. H. G. Bell (chief engineer, N.W.E.B.), Mr. E. G. Wardle (manager, No. 2 Sub-Area), Mr. L. Loukes (sub-area consumers' engineer, No. 2 Sub-Area), Mr. R. O. Ogg (domestic and commercial sales and development engineer, No. 2 Sub-Area), and Mr. J. W. Jones (sub-area planning and construction engineer, No. 2 Sub-Area)*

of itself, bring human happiness. The fact that already we had to import thousands of tons of coal in order to maintain production at its present level provided a challenge, and we must aim at eliminating all inefficient forms of fuel consumption. In the long run this challenge could only be met by the large scale conversion of nuclear energy into electricity. Other speakers were the Lord Mayor, Ald. S. Cooper, Mr. B. Gill, a former president of the Leicester Branch, and Mr. J. Mould, deputy chairman of the East Midlands Electricity Board.

At a social evening held on 22nd October in the canteen of the **Phœnix Telephone & Electric Works, Ltd.,** Hendon, presentations of illuminated addresses and gifts were made to thirty employees of the company who had completed twenty-five years' service or more. After an address by Mr. E. L. M. van Gelder, director and general manager, the presentations were made by Mrs. O. Epstein, a director of the company and daughter of its founder. The party, which had previously been welcomed by the managing director, Mr. E. N. Epstein, included contingents from the Stockton and Manchester factories of the Phœnix group.

For the second time running the St. John Ambulance Nursing and Nursing Cadet teams of the Witton works of the **General Electric Co., Ltd.,** won all the trophies at the ninth annual competition in first aid and home nursing open to any of the company's works. This year a challenge cup was given by Mr. J. J. Gracie, director of the company and Commander of the Order of St. John, for the competitor (man or woman) with the highest marks in the individual practical test. This was won by Mrs. J. Dormer, of the G.E.C. (Witton) Nursing Division. At the close of the competition the teams, judges and visitors were entertained to tea, at which the challenge cups were presented by the Hon. Mrs. Leslie Gamage, Dame of the Order of St. John, who also gave each member of the winning teams a personal gift.

There was a large gathering of members of the **Faraday House Old Students' Association** and an impressive array of distinguished guests at the Savoy Hotel, London, on 28th October for the annual dinner under the chairmanship of Mr. C. C. Inglis, president of the Association. Sir William G. Penney (United Kingdom Atomic Energy Authority) proposed the toast "Faraday House" and said that Faraday's discoveries had revolutionized the world. Faraday House attached great importance to quality of teaching and the need for practical experience. On the practical side Faraday House was the pioneer of the sandwich system, a "streamlined" version of which was now being operated by the Atomic Energy Authority. In referring to energy resources he said that in twenty years' time we should require 100 million tons of coal a year and as a scientist he thought there was nothing to prevent half of this energy demand being provided by nuclear power.

In responding Dr. W. R. C. Coode-Adams (principal) referred to the sandwich system and its advantages. He also announced that the administration of Faraday House had changed and that a new company had been formed, known as Faraday House Engineering College, Ltd.; it would operate on the lines of an education committee or "charity."

The toast "The Guests" was proposed by Mr. E. L. Gethin, immediate past-president, F.H.O.S.A., the response being made by Lieut.-Gen. Sir Ian Jacob, director-general of the British Broadcasting Corporation. Mr. L. H. Short proposed the toast "The Chairman," and Mr. C. C. Inglis replied briefly.

## OBITUARY

**Mr. R. L. Naphtali,** representative in the Manchester area for Ioco, Ltd., for its electrical insulation products, died recently. Mr. Naphtali had acted in this capacity for the past thirty-two years.

**Mr. W. A. Scott.**—The death occurred on 25th October at a Sutton Coldfield nursing home of Mr. William Arthur Scott, M.B.E., A.M.I.E.E.

## WILLS

**Mr. W. H. Cooke,** M.I.E.E., formerly borough electrical engineer at Luton, who died on 22nd July last, left £7,202 gross (7,082 net).

**Mr. L. S. Pywell,** London director of Gent & Co., Ltd., Leicester, who died on 8th July last, left £9,162 gross (£8,979 net).

**Mr. W. E. Shuttleworth,** founder and principal of the Humber Electrical Engineering Co., who died on 16th May last, left £90,105 gross (£62,016 net).

**Mr. J. S. Webber,** founder and chairman of Pifco, Ltd., who died on 31st March last, left £7,448 gross (£4,973 net).

# "George Johnstone" Lecture

Upon the retirement of Mr. George Johnstone from part-time membership of the South Western Electricity Board it was decided to establish at the Seale-Hayne Agricultural College, Newton Abbot, an annual lecture bearing his name and devoted to electricity and farming. The first lecture was delivered on 28th October by Professor H. G. Sanders, chief scientific and agricultural adviser to the Ministry of Agriculture.

Professor Sanders said that although there was a clamour from farmers for electricity the difficulties of connection could be overcome only by planning for full use of the power. The British farmer was being called upon to produce more per acre of land and per man employed. Judged by the number of tractors our farming was more highly mechanized than that of any other country but judged by the use of electric power we should take a more lowly place.

Dealing with the cost of providing rural supplies, Professor Sanders said that while in urban areas it was common to have 200 consumers per mile of mains in the country the figure was often only ten and these were generally cottagers who could not be expected to use much electricity. In towns one transformer might serve a hundred consumers but in rural areas only two or three. After discussing the cost of distribution lines he considered that an annual revenue of 35 per cent of the cost of connection was a justifiable minimum. But the operation of diversity made it possible for Electricity Boards to encourage farmers to install electricity by accepting an annual revenue figure of 20 per cent or even less.

Unhappily so large a revenue was unlikely to accrue and with a minimum annual payment of £70 (a probable figure) the farmer was likely to pay for much more electricity than he used.

To meet that situation the capital contribution method was sometimes used but many farmers could not afford to pay it. The South Western Board had employed a line rental method by which the capital cost was converted to an annual charge which became extinguished as the farmer made fuller use of electricity.

Under its new scheme the Board averaged out the costs of connection of farms over a large development area, charging the same figure for any particular type and size of farm. After taking into account the expected revenue and the financial help given by the Board the remaining costs are pooled and apportioned equitably between the different classes of users. Payment of the contribution could be made in a lump sum or spread over seven years.

It was quite clear that the right way to get over the problem of connection costs was for the farmer to make the maximum economic use of electricity to eliminate or reduce capital contributions and soon extinguish guaranteed revenue or line rental. He thought that this would be accomplished if the farmer realized how cheap electricity was as a source of power; he gave a number of examples to illustrate this.

Professor Sanders also showed how farm profits could be increased by the saving of labour and greater production and had something to say about the "amenity" value of electricity in keeping rural workers on the land. He outlined the rural electrification plans of the Central Electricity Authority and Boards and stressed the need to place the best possible expert advice at the farmer's disposal.

# VIEWS on the NEWS

*By REFLECTOR*

LORD LOVAT is reported by the *Oban Times* to have resented the fact that in the Highlands area electricity cost as much as it did in Aberdeen and Dundee. It struck him as rather hard that Inverness-shire and other Highland local authorities with very large rivers should not be entitled to some concessions or some form of favourable treatment "just as the Lanarkshire miner was entitled to supplies of coal at pithead prices." This seems to be a strange kind of analogy. After all it is only the "raw material" for electricity which the miners get; water is the raw material for Highlands power.

* * *

Speaking at a dinner of the Bath Trades Council last week, Mr. F. Foulkes, president of the Electrical Trades Union, said (according to the *Bath Chronicle and Herald*) that

> "We contend that if our members do anything they are always right until they are proved wrong and if anybody proves they are wrong we will then tell them they are wrong and discuss the problem."

This seems to be a stretching of the principle that a man is innocent until he is proved guilty, to cover what may be very harmful acts.

* * *

Mr. G. E. Brett, of New Barnet, while agreeing with my recent remark that electricity was frequently the first modern service to reach remote villages, puts in a word for the "much maligned" telephone service. He says that this often precedes electricity supply and, in fact, did so in the case quoted—that of the village of Riccarton in Roxburghshire. I gladly pass on this tribute to the Post Office which is too often unjustly criticized.

* * *

I rather like the following purple passage from a recent issue of the *Yorkshire Evening Post*:—

> "Three miles south-east of Leeds is a mysterious city of Brobdingnag, a colossus of brick and steel that has taken nine years to build. It is a city of foaming waterfalls and strong winds. On the record of the British Electricity Authority it is officially known as Skelton Grange power station. To the layman its Brobdingnagian proportions are viewed with stiff necks and silent wonder. It is a giant controlled by press-buttons and it vibrates like a monster seeking freedom."

* * *

With the continuous campaign for fuel economy being waged nowadays it is surprising to find a London Electricity Board night watchman still sitting in his cabin with the traditional coke brazier outside in the open air, providing him with only a fraction of its abundant heat. The nightly consumption of one of these open braziers must be very high and it is surprising that a paraffin radiator of some description has not been developed for the task; or that the Electricity Board has not devised some arrangement more appropriate especially as near to one of its principal office blocks as was the activity in question. Tradition dies hard however and although, like the open fire, the comfort is more imagined than real, the glowing coals may play a part in passing wakefully the small hours of the night.

* * *

One of the unfortunate results of the rapid increase in electrical loads is that sometimes distribution systems are unable to cope with the demand at peak periods. This seems to be the case on two estates at Broughton Astley in Leicestershire the inhabitants of which complain that it is "impossible to cook or even use the radio." When the complaint was discussed by the Parish Council the chairman aptly commented "I think we are having a raw deal." It was decided to send a strong letter to the East Midlands Electricity Board asking for immediate attention to the matter.

* * *

I have received from Mr. D. E. Noad, district commercial engineer at South Shields, a menu produced for an "inter-services" dinner recently held in that town. The term, in this instance, is non-military; it relates to the civil services which operate in the area—the Electricity and Gas Boards, G.P.O. Telephones, the local water company, Rediffusion and the borough engineer's department. All these people frequently come into contact (and occasionally, I suppose, into conflict) and it was a good idea for them to get together socially. The front of the menu bore a drawing symbolic of the services represented, the central feature being a telephone pole carrying cables, water mains, gas pipes, etc., evidently a practice peculiar to South Shields. The borough engineer, Lt.-Col. J. Reid, O.B.E., proposed the principal toast and Mr. Noad responded.

* * *

In last week's *Electrical Review* I noticed an advertisement for a hot water geyser which startled me by announcing:—"No flow of water no electricity used." Upon reflection, however, I saw what was meant.

* * *

Looking through the *Electrical Review* of 3rd November, 1905, I came across a leaderette dealing with a controversy long since dead—private *versus* municipal electricity supply. It concerned a proposal of the London County Council to promote a Bill constituting it a bulk supply authority. This was naturally opposed by the supply companies and also by the London borough councils, who in turn were antagonistic to the supply companies. This three-cornered fight was described by the *Review* as ludicrous and pitiable and it was certain that the Parliamentary Committee dealing with the Bill would not let it pass —which in due course was the case.

# British Standards Institution

## INCREASING ACTIVITIES IN NATIONAL AND INTERNATIONAL SPHERES

THE latest report of the British Standards Institution (240 pages; 5s from British Standards House, 2, Park Street, London, W.1) shows that, during the twelve months ended 31st March last, 197 new and 73 revised British Standards, 228 amendments to existing B.S. and 1,300 licences to use certification marks were issued. Over 4,000 committee meetings were held and the subscribing membership reached 8,300. Nearly 900,000 copies of British Standards were sold, one-quarter of this number being sent overseas.

Brief accounts are given of the most important of the projects in hand which run into several thousands, covering some sixty major industries. Under the direction of the General Council with its six executive and advisory committees (one of which, the Advisory Council on Standards for Consumers' Goods, has been set up only during the past few months), the field of operations is covered by five Divisions—Engineering, Building, Chemical, Textiles and Codes of Practice, the last having been added last year. The more significant of the projects are described briefly in notes which occupy 144 pages of the report.

Of the new B.S., 102 related to the Engineering Division, whose activities also included the publication of 34 revised B.S., 79 amendments, the circulation of 137 Standards in draft for comment and the starting of 127 items of new work.

Reports from the Engineering Division occupy 44 pages, of which eight are concerned with electrical apparatus. This subject is dealt with mainly by the Committee of the Electrical Industry (chairman, Mr. J. R. Beard) and the Codes of Practice Committee for Electrical Engineering (chairman, Mr. P. V. Hunter, and deputy chairman, Mr. Forbes Jackson), but electrical interests are also represented on behalf of leading professional and commercial interests on about 20 committees relating to other industries.

Particulars are given in 28 pages of recent proceedings of the International Organization for Standardization, the International Electro-technical Commission and the International Commission on the Rules for the Approval of Electrical Equipment.

### Annual Meeting

At the annual meeting of the Institution which was held on 25th October, Mr. J. Ryan, on his retirement as chairman of the General Council, reviewed the work of the Institution during his three-year term of office. He made reference to industry's increasing demands on the Institution for services going beyond the mere preparation of national standards—the growing international efforts to secure basic alignment of national standards among the many countries now preparing them; the need to eliminate duplication and overlapping of the standards prepared for different industries; the promotion of the application of standards; the demand for greater publicity services, both in relation to industrial and consumer goods and to home and overseas. He indicated some of the new fields in which British Standards were being prepared—those concerned with measures to deal with air pollution, and to promote road safety; standards for electronic components, television, control instruments for automation, 3-dimensional film equipment, etc.

On the international side Mr. Ryan spoke of the many recommendations now emerging from the International Organization for Standardization and the International Electrotechnical Commission and the importance for this country, with its dependence on international trade, of taking a leading part in this work and of keeping in line as far as it could with international agreements on standards. He referred to the close day-to-day co-operation with Commonwealth countries and the current problems in this sphere—e.g. the approval and certification of certain types of equipment to comply with other countries' safety regulations, and the large question raised for our engineering exports by India's adoption of the metric system.

On the "domestic" side Mr. Ryan referred to the new Advisory Council on Standards for Consumer Goods formed early this year to secure a broad basis of consultation on the needs of consumers and a means of interpreting their demands to industry. The Council was primarily concerning itself at present with discovering what further information the consuming public require to assist them in making their purchases of the more important personal and household goods.

The new appointments announced at the meeting are reported in our "Personal and Social" Section.

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# Manchester Lighting Exhibition

ORGANIZED by the Manchester Federation of Scientific Societies, an Exhibition on Light, held in the Manchester College of Technology from 20th to 22nd October, was intended to illustrate an aspect of science with practical demonstrations to show how vital is the medium of light in pursuit of the objectives of the various societies.

This exhibition was the first of its kind organized by the Federation, which comprises 42 societies with a combined membership of over 10,000. There were 19 displays which traced the story of light from its basic properties and its relation to matter, through its effect on the human eye and the methods by which it is produced, to its various applications. There were also demonstrations of industrial and decorative lighting. The Illuminating Engineering Society figured most prominently in the arrangements and accepted responsibility for features dealing with light and matter, the control of light distribution, light produced by electricity, daylight, street lighting, shop lighting and home lighting and decoration. In addition the I.E.S. arranged exhibits in co-operation with several other scientific societies. The organizing secretary for the exhibition was Mr. W. Wilcock, of the E.L.M.A. Lighting Service Bureau, Manchester.

One of the special features was an example of the latest apparatus in physiotherapy, a Theratkin sunlamp, used for artificial sunlight treatment and exhibited for the first time. This sunlamp has been designed to supersede the carbon arc quartz vapour lamp at present commonly used for general ultra-violet therapy. The ultra-violet source in this new lamp takes the form of four fluorescent tubes with phosphor coated glass envelopes.

In the home lighting and decoration section the E.L.M.A. Lighting Service Bureau, the Walpamur Company, and Mr. S. Ainscow, director of W. H. Smith & Co., Ltd. (electrical contractors), and chairman of Manchester Centre, I.E.S., co-operated in the presentation of harmonious decorative finishes and the use of lighted features. The shop lighting exhibit of the I.E.S. consisted of a shop window equipped to show a wide variety of lighting effects.

# INDUSTRIAL NEWS

## Purchase Tax Increases

As Mr. Butler stated in his Budget speech, the rates of purchase tax on all taxable classes of goods were raised by one-fifth on 27th October, i.e., goods subject to the 25 per cent rate will now bear tax at 30 per cent; the 50 per cent rate is raised to 60 per cent; and the 75 per cent rate to 90 per cent.

In addition a number of articles for domestic use, hitherto exempt from tax, are brought into the 30 per cent range. Among them are "smoothing irons and pressing irons" and iron stands, and "electric kettles and other utensils incorporating heating elements." In Group 12(b) space or water heating appliances operated by "non-mains" electricity are now placed in the 60 per cent range, which also applies to mains-operated heaters.

Group 12(e) is replaced by an exemption for "appliances of the following descriptions incorporating electric fans or electric pumps or both such fans and such pumps:—(i) Solid fuel burning or oil burning space or water heaters and oil burners of a kind used for space or water heaters; and (ii) radiators and convectors for connection to hot water or steam central heating systems."

Details of these and other changes are given in Notice No. 78K issued by H.M. Customs and Excise, King's Beam House, Mark Lane, London, E.C.3.

## British Industries Fair

At a Press conference last week Mr. C. Kenneth Horne, managing director of British Industries Fair, Ltd., reported the progress made so far with the organization of the 1956 Fair in London and Birmingham.

He mentioned that the Chancellor of the Exchequer (Mr. R. Butler) had agreed to open the second part of the Fair in London on 23rd April. Lady Eden was to open the first part at Earls Court on 22nd February. This part was already fully booked up by toy manufacturers, makers of fancy and leather goods, watches and clocks and other "consumers'" goods.

For the first time London would have an electrical section which was supported by the British Electrical and Allied Manufacturers' Association and other associations, and leading concerns in the electrical industry had already booked space. (A list of these was given in our issue of 21st October, p. 805.) It had been decided to organize within the section an electronics display which would, it was believed, be the first of its kind.

They could say definitely that the Fair was going to continue and they were already planning for 1957. Part of the expected expansion might be the result of the Fair providing an "umbrella" under which existing trade shows might join the Fair without losing their own identity. They would then have the advantage of the Fair's world-wide publicity campaign organization.

As a means of strengthening their links with exhibitors the organizers were producing, seven times a year, a "B.I.F. Bulletin," the first issue of which should appear in mid-November.

Mr. Horne made reference to the Birmingham section of the Fair (to be held concurrently with the Olympia display) which, he said, would again show the world that British heavy engineering goods were the finest in the world. Mr. H. O. Missenden, the general manager of the Birmingham Section, organized by the Birmingham Chamber of Commerce, was present at the meeting.

## New Ferranti Research Centre

Ferranti, Ltd., have opened a new research and development establishment in their Aircraft Equipment Department at "Westwick," Bagshot Road, Bracknell, Berks. The department will primarily be concerned with the development of new systems and components for aircraft electrical equipment and instrumentation with particular reference to gyroscopic and associated navigation systems. The chief engineer is Mr. W. A. Mallinson, and the chief research engineer, Mr. J. W. Barnes, late of the R.A.E., Farnborough.

## Centrifugal Separator Factory

The Alfa-Laval organization has opened a new modern factory at Cwmbran, Mon, to meet the increasing demand for centrifugal separators. The factory has been equipped with automatic machines of the latest type for the various precision operations necessary in the production of the component parts of De Laval centrifuges.

## Industry Assists Education

A number of companies in the chemical, electrical, and mechanical engineering fields of industry, concerned at the shortage of scientists, mathematicians and technologists, have decided to assist the teaching of pure and applied science and mathematics in secondary schools. The companies are:—Associated Electrical Industries, Ltd.; British Insulated Callender's Cables, Ltd.; British Petroleum Co., Ltd.; the British Portland Cement Manufacturers Group; Courtaulds, Ltd.; the Distillers Co., Ltd.; the English Electric Co., Ltd.; the Esso Petroleum Co., Ltd.; the General Electric Co., Ltd.; Arthur Guinness, Son & Co., Ltd.; Imperial Chemical Industries, Ltd.; the Imperial Tobacco (Gt. Britain & Ireland) Co., Ltd.; Rolls-Royce, Ltd.; the Shell Petroleum Co., Ltd.; Tube Investments, Ltd.; Vickers, Ltd.; and the Wellcome Foundation, Ltd.

These companies have established an industrial trust to be known as the Industrial Fund for the Advancement of Scientific Education in Schools. For capital works at maintained schools, public funds are available, but no such help exists for independent schools and direct grant schools, at many of which the facilities are seriously inadequate through lack of funds, and it is therefore to these that the sponsoring companies are directing their intentions.

The assistance will be given solely by the provision of capital grants towards the building, expansion, modernizing and equipping of science buildings in independent schools and

*Workshop showing assembled separators at the Alfa-Laval factory, Cwmbran, Mon.*

direct grant schools in the United Kingdom, the Channel Islands and the Isle of Man. Over £1½ million has already been guaranteed but it is believed that many other companies that depend on adequate supplies of pure and applied scientists and technologists will wish to add their support, in their own as well as in the national interest.

An Executive Committee has been formed consisting of the following:—Sir Wilfrid Anson, M.C., M.B.E.; Mr. R. A. Banks; Sir Hugh Beaver (chairman); Mr. E. H. O. Elkington, M.C.; Dr. Willis Jackson, F.R.S.; Mr. W. E. Jenkins, C.B.E.; Prof. G. F. Mucklow, D.Sc.; Mr. J. A. Oriel, C.B.E., M.C.; Dr. F. Roffey, F.R.I.C.; Dr. C. P. Snow, C.B.E.; Prof. Sir Alexander Todd, F.R.S.; Lt.-Gen. Sir Ronald Weekes, K.C.B.; and Mr. A. H. Wilson, F.R.S. This committee will adjudge and assess all applications; its decisions will take into account both the volume and quality of the existing science teaching in any school as well as the nature of the proposals put forward to extend and improve it, and the steps which the school has taken to help itself.

The secretary of the committee is Mr. Peter Ashton, of Courtaulds, Ltd., and the address of the Fund is 20, Savile Row, London, W.1. The trustees are Barclays Bank, Ltd.

## C.S. "Ocean Layer"

The cableship *Ocean Layer*, owned by Submarine Cables, Ltd., left her berth at Telcon Works, Greenwich, this week on her maiden voyage to lay a telephone cable between Denmark and Norway. The new cable will provide the Danish and Norwegian Post and Telegraph Administrations with 60 simultaneous two-way telephone circuits over a distance of about 70 nautical miles. The commander of the *Ocean Layer* is Captain J. Marshall, who joined Submarine Cables, Ltd., in 1952.

## New Instrument Company

The West Instrument Corporation, of Chicago, suppliers of electro-mechanical control and measuring instruments and automatic industrial control equipment for the process and plastics industries, has formed a subsidiary in England, with the title of West Instrument, Ltd., which will manufacture precision industrial temperature control equipment. The new company has commenced operations at 1, Newman Street, London, W.1 (telephone: Museum 3588), while the new factory at Horsham, Surrey, is being completed. The managing director is Mr. J. A. Hartnett.

## Next Year's Radio Show

The Radio Industry Council announces that the annual National Radio and Television Exhibition will be held at Earls Court, London, from 22nd August to 1st September next. There will be a preview for overseas and other special guests on 21st August.

The Radio and Electronic Component Manufacturers Federation is holding its annual private exhibition at Grosvenor House, London, W.1, from 10th to 12th April with (for the first time) a preview for overseas and other specially invited guests on the afternoon of 9th April. Application for admission should be made to the Federation, 21, Tothill Street, London, S.W.1.

## E.I.B.A. Year Book

The 1955 Year Book of the Electrical Industries Benevolent Association is now available. It contains the annual report of the Council for 1954 and the names of the wardens, members of the Council, ex-officio members and the members of the Court. There is also a list of donations received and the names and addresses of the hon. secretaries of the regional and branch committees. A portrait of Sir Harold Bishop, the president for 1955-56, is included.

## A.S.E.E. Exhibition Film

On Thursday last week Electrical Engineers' (A.S.E.E.) Exhibition, Ltd., gave the first presentation of a sound film of the fourth Electrical Engineers' Exhibition held earlier this year. In introducing the film, Mr. F. Flood, chairman of the Council of Management, said that the exhibition from small beginnings had become the largest electrical exhibition in the country. The electrical industry was the second largest exporting industry, and it was the intention of the organizers of the exhibition to encourage overseas visitors. There were present that evening representatives from twenty-three overseas countries. So far nearly 300 electrical concerns had taken space for next year's exhibition to be held from 20th to 24th March at Earls Court (see page 911) and it would be the largest so far held.

The film commences with the opening ceremony performed by Lord Citrine and after a general view of the exhibition, the camera visits individual stands and gives close-ups of new equipment and apparatus on show and of demonstrations in progress. The film is to be shown at the various Branches of the Association throughout the country, but its educational value should have a wider appeal, and we understand from Mr. P. A. Thorogood, the general manager of the exhibition, that it will be available on loan to *bona fide* authorities.

## International Student Exchanges

The eighth annual report of the International Association for the Exchange of Students for Technical Experience shows that in Great Britain there are now 31 universities and colleges affiliated to the central organization established for the interchange of students for practical experience in industry abroad, for periods of 8 to 12 weeks, according to their various courses of study. The Association now covers 21 member countries and it is anticipated that South Africa will join in January, 1956.

The American Society for Engineering Education has recently issued an official mandate to the Institute of International Education in New York to sponsor the administration of the exchange on behalf of American industry and the universities in that country, and it is hoped that this will considerably increase the exchange in 1956 between the U.S.A. and other member countries of IAESTE.

## Dimplex Conference

The third annual Dimplex sales conference was held from 25th to 27th October at the "Victoria," Buckingham Palace Road, London, S.W.1, some 350 delegates representing electrical wholesalers, contractors, Electricity Boards and stores attending. In the conference room there was a comprehensive display of oil-filled electric radiators and new display units were set up for the inspection of the delegates. In his conference address, Mr. E. J. Wade, managing director of Dimplex, Ltd., described the growth of the company. Particulars on the new factory, advertising and sales promotion, sales and servicing and technical developments were given by Mr. H. Roy Heath, director and secretary of the company, Mr. D. N. Dale, Mr. R. C. Flook and Mr. F. Seymour Sweet, respectively, and the conference proper was brought to a close with a film, "The Dimplex Story," and a lively "any-questions" half-hour. Each delegate was presented with a Dimplex radiator in miniature made in Styrene, a flask of brandy being placed in the model radiator.

## Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

| | |
|---|---|
| ALUMINIUM Ingots | ton £171 0s 0d |
| COPPER, H.C. Electro | ton £370 10s 0d |
| Fire Refined 99·70% | ton £369 0s 0d |
| Fire Refined 99·50% | ton £368 0s 0d |
| COPPER Tubes .. | lb 3s 5½d |
| Sheet .. .. .. | ton £437 10s 0d |
| H.C. wire and strip .. | ton £399 15s 0d |
| LEAD, English .. | ton £106 10s 0d |
| Foreign .. .. | ton £105 0s 0d |
| MERCURY .. .. | flask £91 10s 0d |
| TIN, block (English) .. | ton £780 10s 0d |
| ZINC, G.O.B. Foreign | ton £91 0s 0d |
| Electrolytic .. .. | ton — |
| BRASS Tubes (solid drawn) .. .. | lb 2s 8⅞d |
| Sheet .. .. .. | ton £331 5s 0d |
| Wire .. .. .. | lb 3s 3⅜d |
| PHOSPHOR BRONZE Wire .. .. .. | lb 4s 11⅜d |
| PLATINUM .. .. | oz £29 0s 0d |
| RUBBER, No. 1 R.S.S. spot .. .. .. | lb 34⅜d—34⅝d |

## Glasgow Modern Homes Exhibition

A revolving seal, with the "Four Foundations of Modern Living" (electric water heater, electric washing machine, electric cooker and electric refrigerator) balanced on its nose, was the central feature of the South of Scotland Electricity Board's stand at the Glasgow Modern Homes Exhibition held from 5th to 22nd October. The main display area also showed an array of this equipment with small electrical appliances in illuminated compartments. Two demonstration areas were devoted to cooking and refrigeration on one side of the stand, and an electric home laundry on the other. There was a "Wedding Cake Competition" in which a three-tier wedding cake was displayed on a plinth at one end of the stand, and prospective brides were asked to guess what electrical appliance was hidden in each tier. The prize was a replica of the cake. On 21st October, at the final of the children's electric cooking competition, the master of ceremonies and chief judge was Lady Barnett.

## Universities Meet Industry

One of the major problems of management is to secure technically qualified people to fill executive positions. In an endeavour to meet this demand the North-East Industrial Development Association is sponsoring a series of visits to factories by senior industrialists and members of local universities. The purpose of the visits is to give industrialists the opportunity to learn at first hand of the problems facing modern industry and the type of men it requires. The first of these visits was to the factory of Westool, Ltd., St. Helen's Auckland, Co. Durham, on Friday last. Sir James Duff, Warden of Durham University, together with senior representatives of King's College, Newcastle, were present. After a discussion on "What industry wants from the universities" a tour of inspection was made of the Westool factories.

## Prompt Action

All manufacturers of and dealers in electrical appliances have had the task of adjusting prices for the purchase tax additions imposed by last week's supplementary Budget. Dimplex, Ltd., may justifiably claim to have been first off the mark. By 5 p.m. on "Budget Day" new price lists had been prepared for the company's oil-filled radiators and they were posted in time to reach customers by the following morning.

## Damaged Cable

Judgment in favour of the Central Electricity Authority has been given by Mr. Justice Oliver at Newcastle-on-Tyne Assizes in a case where the C.E.A. sued the Alston Limestone Co., Ltd., for damages in respect of a 66 kV cable damaged by the company while working at the Hebburn shipyard of R. & W. Hawthorn Leslie & Co., Ltd. An employee using a pneumatic drill struck the cable while excavating at the shipyard. The Alston Limestone Co. stated that they did not know the cable was near the surface, but Mr. Justice Oliver, giving judgment, said the company had been clearly warned about the cable and had been told to be careful while excavating. Mr. J. F. Drabble, for the C.E.A., stated that the amount of damages would have to be decided by a special referee.

*The finalists in the children's electric cooking competition at the Glasgow Exhibition*

## Scientific Instrument Convention

The fourth annual convention of the Scientific Instrument Manufacturers' Association will be held at the Grand Hotel, Eastbourne, from 10th to 13th November. This year, for the first time, representatives of the British Industrial Measuring and Control Apparatus Manufacturers' Association have been invited to attend and join in the discussions. The main guest and speaker at the plenary session will be Mr. Kenneth Horne, managing director of the British Industries Fair, Ltd. Representatives of Government departments will attend. There will be four discussion panels, which will deal with the following subjects: Financing the firm, education and training, labour-management relationships, and how to sell overseas.

## Batti-Wallahs' Society

The guest speaker at last week's luncheon of the Batti-Wallahs' Society was Sir Howard Roberts, Clerk of the London County Council. In his earlier years Sir Howard was assistant prosecuting solicitor at Liverpool, and his address was mainly concerned with his reminiscences whilst holding that post. His interesting stories gave an insight into the police methods of crime detection. Mr. T. C. F. Bigland (the "Mate") announced that Sir Harold Bishop had been elected an honorary member of the Society and that the next luncheon would be held on Thursday, 24th November.

## Australian Duty on Motors

A number of increases in import duty were put into force by the Australian Government on 14th October. Among the items affected are totally-enclosed d.c. mill type motors on which the duty is now as follows: British preferential tariff 22½ per cent *ad valorem* (formerly free); most-favoured nation tariff 35 per cent (against 12½ per cent); and general tariff 45 per cent (against 12½ per cent). The British preferential duty on switch units, circuit-breakers other than outdoor circuit-breakers for 1,000-2,500 V, up to 150 MVA, and 2,500-15,000 V, up to 250 MVA, is raised from 22½ to 27½ per cent *ad valorem*.

## B.T.H. Overseas Association

On 21st October the annual dinner of the B.T.H. Overseas Association was held in Rugby at which the guest of honour was Lord Baillieu, K.B.E., C.M.G., chairman of the English Speaking Union of the Commonwealth.

In addition to directors of the British Thomson-Houston Co., Ltd., the guests included several directors of Associated Electrical Industries, Ltd., amongst whom were Mr. A. Comar Wilson and General Sir William Morgan, G.C.B., D.S.O., M.C., chairman of Siemens Brothers & Co., Ltd.

*Lord Baillieu (centre) watching a machining operation in the turbine factory during a tour of the B.T.H. Rugby works*

Representatives from other associated companies within the A.E.I. organization were also present. Before attending the dinner in the evening, Lord Baillieu and Mr. Comar Wilson paid a visit to the B.T.H. Rugby works where they were welcomed by Mr. E. H. Ball (managing director), Mr. W. S. Steel (director, plant and apparatus sales) and Mr. G. S. C. Lucas (director and chief electrical engineer). Before lunch Lord Baillieu was conducted on a tour of the main research laboratory building by Mr. L. J. Davies (director of research and education), and in the afternoon saw something of the company's activities in the field of heavy electrical engineering under the guidance of Mr. W. S. Steel, Mr. H. E. Cox (manager, Rugby works) and Mr. H. Dreghorn (general superintendent).

Mr. W. S. Steel (president, B.T.H. Overseas Association) was chairman at a dinner in the evening, held at the Masonic Hall, Rugby. "Our Guests" was proposed by Mr. S. R. Eade (general manager, lamp and lighting factories), and Mr. L. Drucquer (manager, home sales) responded to the toast of "The Company" by Mr. N. Chigier, a member of the Overseas Association. Mr. F. D. Gunton (assistant manager, Education Department) proposed "The Association," to which Mr. W. Spence (assistant manager, Industrial Engineering Department) responded. Replying to the toast of "Our Guests," Lord Baillieu said he considered that the Overseas Association played an important part in establishing personal contacts between young engineers of the Commonwealth.

## Damages Award

Damages of £8,200 were awarded against the Central Electricity Authority at Chester Assizes on 21st October to a former employee who sustained injuries when his safety belt broke while he was working as a linesman on a pylon at Aintree. The plaintiff was Mr. John Peter Wallace McLellan (32), of St. Asaph. It was stated that he fell 35ft and sustained a fractured skull and injuries to his brain. Defendants admitted liability.

On the application of the defence, Commissioner Sir Ernest Goodman Roberts granted a stay of execution for 21 days pending the possibility of an appeal.

## Prevention of Timber Rotting

A Press conference was held recently by Hickson's Timber Impregnation Co. (G.B.), Ltd., to describe the successful production of "Tanalith C," an improved timber impregnant which is especially suitable for the louvres of cooling towers and for wooden transmission line or telegraph poles, particularly in hot climates.

Certain conditions arise when wood is subjected to hot wet conditions causing "soft rot" as distinct from the better known brown and white rots. The mould concerned softens the timber which then loses strength and fails.

An improved impregnant has now been developed capable, it is claimed, of preventing all the known varieties of rot as well as insect attack. Cooling tower louvres treated with it have so far shown no signs of rot in the worst conditions.

## Commercial Catering

A three-day residential course on commercial catering was held at the Imperial Hotel, Blackpool, under the auspices of the British Electrical Development Association, from 25th to 27th October. It was attended by representatives of the South Wales, the Merseyside and North Wales, the East Midlands, the Midlands, the North Eastern, the North Western and the Yorkshire Electricity Boards, Belfast Corporation Electricity Department and the Electricity Board for Northern Ireland. A wide range of commercial catering equipment was on exhibition. The course was opened by Mr. G. A. Robertson, manager, No. 4 (Preston) Sub-Area, North Western Electricity Board, and Mr. H. G. Gamble, of the Eastern Electricity Board.

## Electricity in Housing

"Electricity a Power of Good for Improvements and Conversions" was the theme of the E.D.A. stands at the National Housing and Town Planning Exhibition held at the Corn Exchange, Brighton, from 26th to 28th October. The part played by electricity in typical improvement schemes in old houses was outlined by display matter, including detailed plans showing the layout of property both before and after conversion and modernization, and by examples of actual electrical appliances.

## Clyde's Mill Power Station

In our article on the extensions to this power station in last week's issue we referred to the various boiler feed pumps installed. These were supplied by G. & J. Weir, Ltd., of Glasgow.

## Electrical Commercial Travellers

The annual general meeting of the Electrical Trades' Commercial Travellers' Association will be held on 18th November (6 for 6.30 p.m.), at The Feathers Hotel, Broadway, Westminster, S.W.1. Dinner will be served at 6.30 p.m., and the meeting will follow at 7.30 p.m. Applications for dinner tickets (5s 6d each) should be made to Mr. A. J. Murray, "Merry & Wise," 46, Winstanley Road, London, S.W.11.

## Fruit Picker's Death

An inquest was held at Stourport (Worcs) recently on James Willetts, of Dunley, near Stourport, who sustained a fatal electric shock while picking fruit. Evidence showed that he was using a metal ladder which fouled an 11 kV line. A Midlands Electricity Board engineer, Mr. R. Eccles, said that the height of the conductors was normal for that voltage and in fact was 3ft more than required by the regulations. No special steps had been taken to warn owners of orchards of the risk of using metal ladders.

In recording a verdict of "Accidental death" the Coroner said that although the cable was 20ft above the ground consideration should be given to higher mounting in places where metal ladders were in use.

## Trade Announcements

**Cantie Switches, Ltd.,** has appointed Robert Garmany & Son, Ltd., as its agents in Northern Ireland and Eire. This is a newly registered company under the managing directorship of Mr. T. M. Calvert to carry on the business of the late Mr. R. Garmany, who acted as agent for Cantie Switches, Ltd., for many years. The address of the new company is 33, Queen Street, Belfast (telephone: Belfast 23811).

**British Klockner Switchgear, Ltd.,** asks us to state that it is not associated in any way with the Klockner-Moeller Co. of Germany. It makes this request because many machine tools are being imported into this country from Germany which have fitted control gear made by Klockner-Moeller, and British Klockner Switchgear is receiving requests to supply spares and give service on these control panels.

The **Automatic Coil Winder & Electrical Equipment Co., Ltd.,** has taken over the sales of the laminating, wire stripping and coil winding equipment made by Blume & Redecker, of Hanover, in the United Kingdom and Commonwealth markets, as well as for China, Japan, Argentina, Russia and Russian satellite countries.

The office of the **J. L. Eve Construction Co., Ltd.,** at 208, Green Lanes, Palmers Green, N.13, has been transferred to Frodsham House, 443, High Street, Cheltenham, Glos (telephone: Cheltenham 5008).

The **Nevelin Electric Co., Ltd.,** has moved to a newly acquired factory on a 30-acre site in Surrey. The new address is Hurst Green, Oxted (telephone: Oxted 1450).

The address of the London office of the **Danfoss Manufacturing Co.** is now 13, Queensway, W.2 (telephone: Bayswater 1633).

**Griffin & George, Ltd.,** announce that as from Monday next, all London and southern counties orders, etc., will be dealt with from their recently extended offices and warehouse at Ealing Road, Alperton, Wembley, Middx (telephone: Perivale 3344).

**Mersey Cable Works, Ltd.,** announces that its cables are now available for immediate delivery from the branches of its associate company, the Simplex Electric Co., Ltd.

# DAIRY SHOW

## Electrical Aids for the Farmer

*General view of the E.D.A. stand at the Dairy Show*

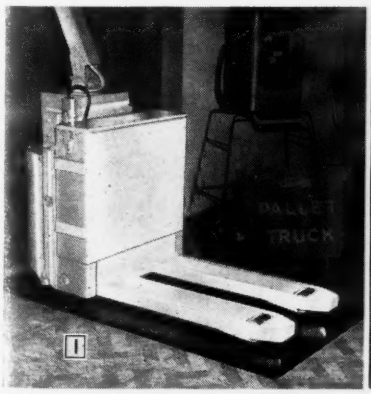
EXHIBITS at the sixty-ninth annual Dairy Show, organized by the British Dairy Farmers' Association, and held at Olympia last week, included a number of machines and appliances entered for the Association's silver and bronze medal awards, offered annually for equipment showing distinct and practical improvement, especially in the saving of labour. Entered in this class was the Gascoigne electronic milking system for all types of milking machines, except (at present) self-contained mobile milkers. The equipment consists of a master electronic controller, from which pulsations are transmitted electronically to special line pulsators. Pulsations are conveyed through a relay to the teat cups, there being no electrical connection between the line pulsator and the cow. The a.c. mains supply is stepped down and rectified to give 12 V d.c., and provision is made for operation from a 12 V battery in the event of mains failure.

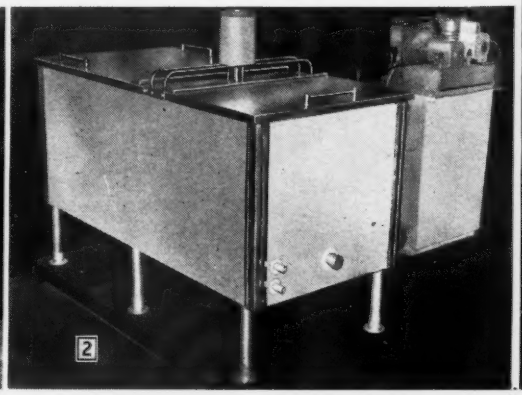
The various applications of electricity on a typical dairy farm having a herd of 30 cows were demonstrated on the British Electrical Development Association's stand. On display were electrical appliances for water heating, steam raising and chilled water milk cooling. These were supported by detailed figures of the annual costs of providing the three services, which indicated that the daily cost per cow amounts to only 2¼d. The equipment included a Prestcold chilled water unit, a Woolley water heater and steam sterilizer, and also a Martin's "Comet" mill and a Holland vertical mixer for animal food preparation. Separate displays showed infra-red heaters, both bright and dull emitters, for the rearing of chicks, piglets and calves, and there were sectional models of electric water pumps, both of the submersible and piston types. A selection of well-glass, corrosion resisting and other lighting fittings suitable for both filament and fluorescent lamps were also included on this stand.

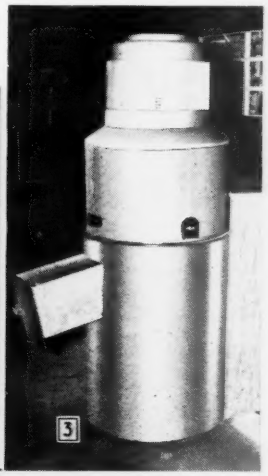
Undoubtedly the most suitable method of transport for local dairy delivery work is the electric vehicle, and several manufacturers had models on view. Smith's Delivery Vehicles, Ltd., confined their exhibits to their larger models incorporating many detail improvements, one of which is the fitting of a grocery display compartment to their 1 ton NCB electric dairy truck. This has been developed at the request of a number of customers who now take out a proportion of produce with their dairy deliveries. Detachable cab doors, rubber rear buffers and aluminium flooring on the loading deck are features of the company's 30 cwt model and their 2 ton truck, claimed to be the largest standard dairy truck made, now incorporates sliding cab doors.

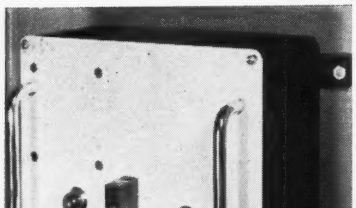
Diamond Motors (Wolverhampton), Ltd., included among their display of electric vehicles a new 6in lift pallet truck. It has a total lifting capacity of 20 cwt and is equipped with a 1 h.p. motor powered by a 24 V 103 A/hr battery. A feature of this extremely compact unit is the

**1.** *Diamond Motors' pallet truck.* **2.** *Purlac Equipment combined milk cooling and storage tank.* **3.** *York Shipley "Flak-Ice" automatic ice maker*

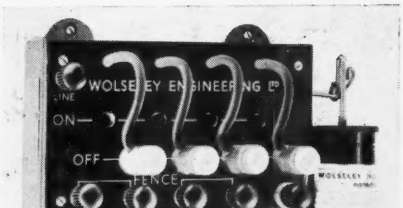


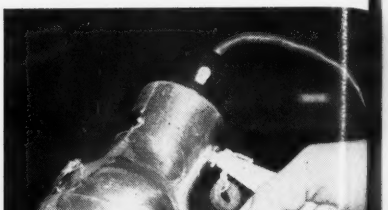





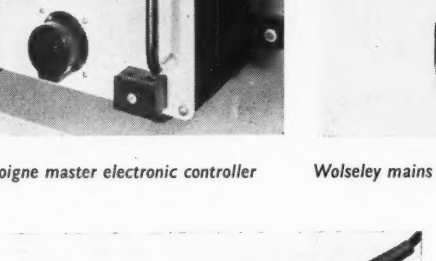
*Gascoigne master electronic controller*




*Wolseley mains fencer control panel and shock tester*



*Hamer Incubators "Kwik-Ray" egg t*



*"Premier" electric clipper (R. A. Lister)*

speed and ease with which the battery can be changed when the unit is required for shift work in the dairy, etc. Improvements in the details of design were also to be seen in the models shown by Helecs Vehicles, Ltd., Harborough Construction Co., Ltd. (pedestrian controlled delivery vehicles), Wales & Edwards, Ltd., Hole's Electric Vehicles, and T. H. Lewis, Ltd.

Despite the wide range of battery voltages and capacities used in modern electric delivery vehicles, Westinghouse Brake & Signal Co., Ltd., have designed three case sizes which accommodate the components required for building a charger to suit any of these batteries. These were displayed by the company in addition to enlarged pictures of actual installations which enabled visitors to see for themselves how "Westalite" chargers can be installed.

A milk cooler and tank combined, which will enable the farmer to milk straight into the tank, cool the milk as it comes from the bucket and store it for any length of time, was shown for the first time by Purlac Equipment, Ltd. The tank has a capacity of 150 gal and the initial charge of one milking can be cooled within 15 min; subsequent additions are re-cooled to 40 deg F within 30 min. It can be used with any iced water milk cooler which the farmer may already possess without additional installation, or obtained as a self-contained unit.

On the refrigeration side several other milk coolers and cold rooms, etc., were to be seen and Prestcold had a special display of their low-temperature unit cooler and automatic de-frost system arranged in a 150 cu ft display cold room. Weir Equipment included examples from their range of refrigeration compressors, three types of homogenizer and a direct acting boiler feed pump. York Shipley, Ltd., exhibited a prototype of their new "Flak-Ice" self-contained automatic ice maker. This machine is capable of a daily output of 250 lb of flaked ice; it is powered by a $\frac{1}{2}$ h.p. hermetically sealed unit.

A mains fencer control panel developed by Wolseley Engineering, Ltd., for use where several fence circuits are energized enables each circuit to be checked individually and collectively by a shock tester which can be hung on the side of the unit and simply pulled down to obtain the necessary reading. It also allows any faulty fence to be disconnected from the general circuit. Also shown by this company were several other new items including pattern pigtail posts, incorporating rigid p.v.c. insulation, "cat's whisker" insulators and pigtail insulators for angle iron and wooden posts. A wide range of other electrical appliances displayed by this company included a portable animal coaxer, a cattle de-horner and horse and cattle clippers. A new electric clipper, the "Premier," was shown on R. A. Lister & Co.'s stand. It incorporates a built-in control switch and weighs 44 oz. Models are obtainable for use on either 230 V or 110 V a.c./d.c.

Infra-red heating units for rearing poultry and piglets continue to gain in popularity. The Churn Co. displayed their new "Brent" infra-red brooding and heating unit the approximate chick capacity of which is 80 to 100; it is fitted with an 8in reflector and 250 W dull emitter heater. A plastic hover, shown by Hamer Incubators, has been designed to cut operating costs and add to the efficiency of infra-red lamps. Being made of semi-transparent plastic material, the hover affords a constant view of the chicks under the light. The diameter is 5ft and it has a capacity of 250 chicks. The same company also displayed the "Kwik-Ray" egg tester which enables up to 3,000 eggs an hour to be tested. Constructed of aluminium, it is light in weight and a rubber-tipped nozzle prevents damage to the eggs.

Also of interest to the poultry farmer was a portable de-beaker shown by Cope & Cope, Ltd. Two models are available, a battery type fitted with crocodile clips for easy connection to a 12 V battery and one suitable for use from an a.c. supply through a transformer.

## Birmingham Illumination Design Course

An Illumination Design Course, organized by the Central England Area office of the E.L.M.A. Lighting Service Bureau, will be held at Regent House, St. Philip's Place, Colmore Row, Birmingham, on Thursday evenings, commencing on 17th November and concluding on 15th December. Applications for reservations should be made to the Birmingham office at 111, New Street.

# Birmingham Central College

## FIRST SECTION OPENED BY THE QUEEN

ON Wednesday Her Majesty the Queen officially opened the first section of the new Birmingham Central College of Technology, Commerce and Art. The foundations for the College, which is near the centre of the city, were laid just before the war, but the project was then suspended.

The section just opened gives facilities for education and research in most sections of electrical engineering, metallurgy, building, optics, hydraulics, etc., and consists of large, mechanically ventilated, general teaching rooms, drawing offices, laboratories and workshops, provision also being made for a large refectory, dining room, kitchens, snack bar, students' common room and a well-equipped library.

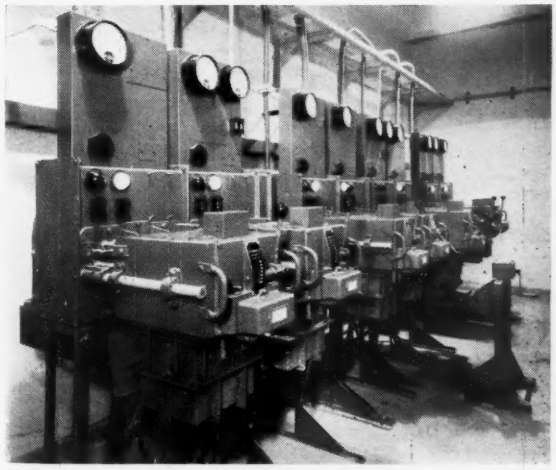
The lighting of the general teaching rooms is obtained by enclosed glass pendants giving not less than 20 lumens/sq ft, laboratories by enclosed glass pendants fitted with metal reflectors, giving an average of 25 lumens/sq ft and workshops by "Glasteel" reflectors or dispersive reflectors with glass visors giving lighting intensities varying from 17 to 22 lumens/sq ft.

The power requirements in the various laboratories range from 13 A socket outlets fixed to walls or benches for normal a.c. supplies to prefabricated wall mounted switch panels to give facilities for extensions to be carried out by teaching staff as and when these are required for experimental purposes.

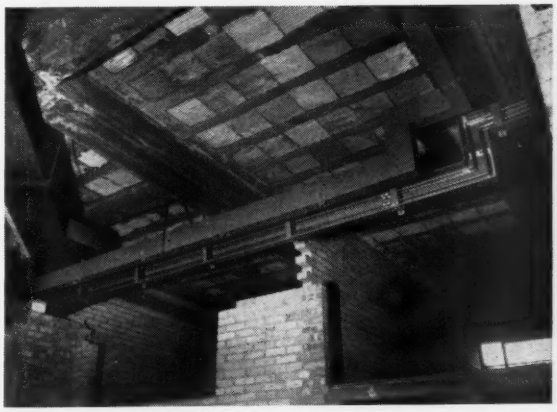
D.c. supplies of various voltages have been arranged for use in the main laboratories, the general d.c. supply of 220 V being obtained from a mercury arc rectifier having a capacity of 60 kW situated in a main switchroom in the basement. Other d.c. voltages are obtained from individual local metal rectifiers.

Separate lighting and power busbars contained within totally enclosed sheet steel casings have been used, fixed above the main corridors on every floor, in the service ducts provided.

Connected to these busbars via appropriate sized fuse-switches, are all the required lighting and power fuseboards which have been sited in all main rooms, to give localized supplies. This arrangement has reduced considerably runs of steel conduits to lighting and socket outlet points.



*Main m.v. circuit-breaker board*



*Horizontal busbars during construction*

The fuse-switches and fuseboards are contained within specially formed concealed cupboards, backing on to the busbars and opening into the departments concerned, thus giving easy access, at the same time providing facilities for extension or change-over purposes. Lighting busbars are of the four-bar pattern of 100 A size and the power busbars are also of the four-bar pattern but of 200 A size.

In the corner of the building the horizontal busbars are linked by means of enclosed four-bar vertical rising busbars of 300 A size for lighting and 400 A size for power, connections being taken from these via suitably sized h.r.c. fuse switches, each being provided with indicating pilot lamps giving indication when supplies are connected in ring form to the horizontal busbars.

Electrical supplies are taken at 11 kV into the main transformer room situated in the basement of the building. Two 1,000 kVA transformers have been installed with the necessary h.v. switchgear by the Midlands Electricity Board and there are three 800 A t.p. and n. oil-immersed m.v. circuit-breakers.

From these 800 A units copper busbars in sheet steel casings are taken to the main medium voltage switch panel situated in a separate adjacent room. This m.v. switch panel consists of oil-immersed circuit-breakers of varying sizes, and is split into three sections covering the various services for lighting, small power requirements throughout the building, and heavy power arrangements required for the main boiler house auxiliaries, the main ventilation plant, electric furnace loads, etc.

The boiler house plant, consisting of moving grate coal burning boilers, is fully electrically controlled, together with the coal conveyors, vibrators, etc., and should breakdown occur on any part of this plant a warning klaxon is sounded.

The building is equipped with four high-speed fully automatic passenger/goods lifts together with two service lifts for the kitchen and snack bar use. A system of emergency lighting has also been installed.

To equip this section of the college approximately 20 miles of various sizes of heavy gauge steel welded conduits have been used, containing some 72 miles of v.r.i. cables.

There are some 450ft of vertical busbars, 5,000ft of horizontal busbars of several sizes, approximately 900 yd of paper-insulated lead-covered and served cables, 1,750ft of ordinary cable trunking, 2,200 lighting points and 1,300 lighting and power socket and switch socket outlets for various a.c. and d.c. services.

It is now proposed to extend the present buildings to cater for further electrical, chemistry, thermodynamics, bacteriology, biology, pharmaceutical, physics and other subjects.

The work described has been carried out by the Midlands Electricity Board to the designs of the consulting engineers, Messrs. Hoare, Lea & Partners, of Birmingham, in collaboration with the architects and heads of departments of the existing college.

The principal suppliers of equipment were:—Main switchgear, J. G. Statter & Co., Ltd.; distributing busbars, General Electric Co., Ltd.; fuseboards, G. P. Dennis & Co., Ltd.; lighting fittings, Best & Lloyd, Ltd., Falk, Stadelmann & Co., Ltd., and G.E.C.; switches and sockets, Walsall Conduits, Ltd.; rectifier, Partridge, Wilson & Co., Ltd.; lifts, J. & E. Hall, Ltd.; battery, Hart Accumulator Co.

# Nuclear Research Measurements

THE discussion on "An Electrostatic Particle Accelerator" and "An Electrostatic Analyser for the Absolute Measurement of Proton Energies and the Establishment of Fixed Points on the High-Voltage Scale," two papers presented before the Measurement and Control Section of the Institution of Electrical Engineers and reported in the *Electrical Review* of 28th October, was opened by Mr. F. R. Perry (Metropolitan-Vickers Electrical Co.). Means for producing high voltages, such as the electrostatic particle accelerator, he said, were simple in theory, but in practice they were much more complicated and erratic. He would like to have more details of the performance of the Van der Graaff generator referred to—the voltage with and without a tube, for instance, and how the current in the beam compared with some of the American designs on which it was based.

Dr. J. M. Boag (Medical College, St. Bartholomew's Hospital) congratulated the authors on having designed their machine before they built it. While this led to delay, perhaps, it paid in the end. The M.R.C. generator had had to be built before the design was fully worked out, and while this process sometimes led to a lusty child, it was apt to cause neuroses which took time to eliminate. For accelerators used in nuclear physics research, he said, high voltage and voltage stability were the chief requirements, current being of less importance. Small currents and therefore small tubes could be accepted. In biological work with radiations the problem was to produce maximum radiation output. This required both high voltage and high current, and therefore a large diameter tube.

Dr. H. R. Allan (Imperial College of Science) remarked that the A.E.I. had done a fine engineering job. University laboratories were usually asked to work with string and sealing wax, and it was a pleasure to see things built properly. One of the problems in nuclear research was to keep down X-ray intensities, and the technique of stabilizing by electron beams going up the tube might not be wise. X-rays might also cause trouble through further ionization in the insulation of the gas.

Mr. D. Moore (Hammersmith Hospital) pointed out that the Van der Graaff generator with which he was concerned could be used on biological research with the accent on high currents and not on precision voltage stability. The demands on this type of machine were unique in that an output of X-rays or electrons or neutrons might be required. These criteria called for a wide accelerating tube and an efficient belt charging system.

Mr. P. H. Flanders (Hammersmith Hospital) observed that the generating tube was the weakest link in the machine. A great debt was owed to America for making available their designs for accelerator tubes and machines. It was refreshing, however, that after studying other machines Messrs. Chick and Petrie had decided to do a new engineering job based on Dr. Boag's methods. They had a very satisfactory stack design and an admirable open-circuit voltage performance.

Mr. R. L. Fortescue (Queen Mary College) praised the unique electrostatic design of the machine, but asked whether the use of maximum field strength was justified; on long gaps the mean field strength was at least as useful as the peak field strength. He drew attention to the statement that time lags differed as between gas breakdown and tube breakdown. All work on vacuum breakdown showed very short time lags, he said.

Dr. A. Nemet asked how the authors calibrated their generating voltmeter. It was not an instrument that could be calculated very accurately, he thought.

## Premiums for Technical Writing

NON-PROFESSIONAL writers of technical articles dealing with radio and electronics, including specialized applications to any industry, and the editors responsible, are reminded in a leaflet issued by the Radio Industry Council of its premium award scheme, now in its fourth year and nearing the time for judging. Up to six premiums of 25 guineas each are offered yearly in respect of articles which, in the opinion of the Council's panel of judges, are likely to enhance the reputation of Great Britain in radio, television and electronics.

The 19 awards so far made have happened to be mostly for articles in radio and electronic journals, but it is pointed out in the leaflet that many industries are increasingly using electronic methods of control and production and articles in the journals serving a wide variety of industries are eligible provided they can be bought by the public on bookstalls or by subscription.

An innovation now announced is that one of the six premiums will be open for articles published in manufacturers' own journals with an overseas circulation, provided they also can be bought by the public. Articles in privately published journals of professional bodies are not eligible.

The judges, headed by Professor H. E. M. Barlow, Professor of Electrical Engineering, University College, London, believe that an article, to have maximum impact, should have a non-technical introduction setting out the aims and applications of the techniques described and if possible economic advantages, the object being to interest executives and administrators as well as scientists and engineers. Value of the article in making known British achievement, originality of subject, technical interest and presentation and clarity are the criteria.

For entry, copies of the journal or pages have to be sent before the end of the year to the Secretary, Radio Industry Council, 59, Russell Square, London, W.C.1, with a written declaration that the writer is eligible.

# Wembley Stadium Floodlighting

A NEW £22,000 permanent floodlighting scheme has been installed at Wembley Stadium, planned and supplied by the General Electric Co., Ltd. It is the first permanent arena floodlighting system to be installed at Wembley and is the largest in the United Kingdom. The size of the arena presented a number of problems and extensive trials with alternative systems were carried out before the G.E.C. system was chosen. The first football match under the new lighting took place on Wednesday last week when London played Frankfurt.

The new floodlighting system was planned by G.E.C. lighting engineers in conjunction with the company's research laboratories at Wembley. It consists of 192 floodlights mounted 100ft above the ground in groups of twenty-four on eight towers. All groups combine to use 340·4 kW of lighting load. To ensure the maximum of illumination and the minimum of glare, the installation is a combination of four optical systems.

By the light of the new system, spectators at every side of the field can see every detail of play. Distant players stand out brightly against comparatively dark backgrounds. An asset for referees is the ease with which, by means of special wide-angle lights, the lines and linesmen are illuminated clearly in all parts of the field. To ensure full safety for spectators the floodlighting towers are constructed of welded tubular steel. Special tests were carried out under the supervision of the engineering consultant to Wembley Stadium, Ltd., Sir Owen Williams.

The system comprises 60 narrow beam symmetrical optical systems using 1,500 W "Osram" projector lamps, 72 medium angle and 44 wide angle light distributions using 1,500 W general lighting service lamps. Sixteen wide-angle asymmetrical floodlights with 2 kW "Osram" horizon type line filament lamps are installed on each of the two central towers. They are trained so as to give a high standard of illumination on players at the far side of the ground, and are cut off sharply to prevent glare in the eyes of spectators on the terraces opposite. The system is flexible, and the floodlights can be trained to give any distribution of light which might be suitable for events other than football matches. Specially designed filament screens were fitted to all the symmetrical floodlights, each adjusted to cut off direct view of the lamp filaments from the spectators, but not the players. It was considered that the accumulation of the direct lamp flux, although small when compared to the total beam lumens, was useful in helping to reduce the diversity factor and in adding to the illumination of the ball when it is travelling through the air.

A special feature of the installation is the dramatic effect obtained by the provision of expanded metal resistors in each of the four main feeders, each of which supply two groups of floodlights. Before play begins, and during half-time, the resistors are in series with all the lamps and the effective voltage across the lamps is reduced from 210 V to 185 V. By the use of contactors and remote control switches the resistors are shorted out and the illumination is raised to full brightness immediately the players enter the stadium. This arrangement also has the practical advantage of pre-heating the lamp filaments with a consequent safeguard of lamp life.

The welded tubular steel towers on which the floodlights are mounted were constructed and installed by Tubewrights, Ltd. Over five miles of cable was used for wiring the system, and the electrical installation was carried out by A. G. Allen & Co., Ltd., Wembley.

*Above: The G.E.C. floodlighting system at Wembley Stadium showing (left) a football match in progress and (right) lining up each unit with the aid of a remote photometer during installation*

## Marine Propulsion

AS the subject of his presidential address to the Institution of Mechanical Engineers, Mr. P. L. Jones discussed principal differences between marine and land practice in the development of steam turbines and oil engines. Since the propeller was essentially a low-speed device and the turbine (to secure fuel economy) was a high-speed machine, the use of gearing was necessary. Greater accuracy in production of gearing of recent years had greatly reduced weight and space and, to some extent, cost. Marine turbines were required to reverse or manœuvre frequently and in some installations they were able to do so while operating continuously in one direction by means of an electric drive. This important advantage, he said, was usually more than offset by loss of efficiency in transmission and increase in weight and cost. With the oil engine gearing, while reducing overall weight, reduced efficiency by 5 or 6 per cent. In some recent turbine ships of only 8,000 s.h.p. the thermal efficiency was over 25 per cent, while for oil engines it reached 37 to 38 per cent.

Nearly all new marine turbines in this country were to the designs of Pametrada, which possessed facilities for testing large steam turbines at full power and designed steam conditions. Heat developed by nuclear energy would no doubt be transmitted more or less directly to the working parts of a gas turbine as soon as higher gas temperatures could be accepted with confidence; one advantage, in addition to the higher thermal efficiencies, would be that the weight of the bunkers at the end of a voyage would be nearly the same as at the start.

***Domestic Electrical Equipment***

# Thermal Storage Water Heaters

As a means of providing the daily hot water requirements at the sink for cooking and washing up purposes, the thermal storage water heater (1½ to 3 gal) is invaluable and the large number in use is an indication of their efficiency.

Installation is a simple matter. With the cistern type it is only necessary to provide a connection to the cold water mains and pipes can be run to give a supply of hot water to serve not only the kitchen but also the bath and wash basin.

Among new models which have come on to the market since our last survey is the Heatrae "Lido" range, available in 1½ and 3 gal sizes. In addition to white, which is perhaps the most predominant colour for this type of water heater, models are also obtainable in green, cream and blue. The G.E.C. range has been revised and we understand that their practice of naming the non-pressure and pressure models, single-point and multi-point respectively is proving popular with the trade. Similarly, their dual-heat 20 gal water heater is described as a two-heat multi-point model. New additions are also announced by Mitchell Electric, Ltd.

Since the prices were received from the makers purchase tax on water heaters has been raised by one-fifth (from 50 to 60 per cent) and adjustments must be made for this increase in the following tables.

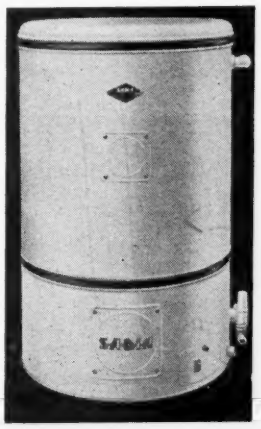
| Manufacturer | Name or Model | Type | Capacity | Loading | Finish | Price (excl. tax) | Purchase Tax* |
|---|---|---|---|---|---|---|---|
| AIDAS ELECTRIC, LTD., Rowdell Road, Northolt, Greenford, Middlesex. | G | Wall mounting, free outlet | 1½ gal | 500 W or 750 W | White with blue bands | £10 10 0 | £4 1 11 |
| | H | Wall mounting, free outlet | 3 gal | ½ kW to 1 kW | White with blue bands | £12 10 0 | £4 17 6 |
| | Select | Rectangular wall mounting, free outlet | 3 gal | 1 kW | Various colours, chromium mouldings | £15 0 0 | £5 17 0 |
| | U.T.C. | Wall mounting, free outlet or pressure | 3 gal | 1½ kW | White with blue bands | £12 12 0 | £4 18 4 |
| | U.T.C. | Floor mounting, free outlet or pressure | 3 gal | 1½ kW | White with blue bands | £13 2 0 | £5 2 3 |
| | B | Wall mounting, free outlet or pressure | 5 gal | ½ kW to 1 kW | White with blue bands | £17 0 0<br>£16 0 0 | £6 12 8<br>£6 4 10 |
| | L | Wall mounting, free outlet or pressure | 7½ gal | ¾ kW or 1 kW | White with blue bands | £19 0 0<br>£18 0 0 | £7 8 3<br>£7 0 5 |
| | C | Wall mounting, free outlet or pressure | 12 gal | 1 kW or 1½ kW | White with blue bands | £23 10 0<br>£22 10 0 | £9 3 4<br>£8 15 6 |
| | D | Wall mounting, free outlet or pressure | 15 gal | 1½ kW | White with blue bands | £26 10 0<br>£25 10 0 | £10 6 9<br>£9 18 11 |
| | U.D.B. | Floor mounting, pressure | 20 gal | 1 kW plus 2 kW | Mottled grey | £29 0 0 | £11 6 3 |
| | U.D.B. | Floor mounting, pressure, wall mounting, pressure | 20 gal | 1 kW plus 2 kW | White with blue bands | £30 0 0<br>£30 15 0 | £11 14 0<br>£11 19 11 |
| | U.D.B. | Floor mounting, pressure | 30 gal | 1 kW plus 2 kW | Mottled grey | £34 10 0 | £13 9 2 |
| | U.D.B. | Floor mounting, pressure, wall mounting, pressure | 30 gal | 1 kW plus 2 kW | White with blue bands | £35 10 0<br>£36 5 0 | £13 16 11<br>£14 2 9 |
| | I.S. | Floor mounting, pressure | 40 gal | 3 kW<br>6 kW<br>9 kW | White with blue bands | £55 0 0 (3 kW)<br>£63 16 0 (6 kW)<br>£72 12 0 (9 kW) | £21 9 0 (3 kW)<br>£24 17 8 (6 kW)<br>£28 6 4 (9 kW) |
| | B.B.T. | Wall mounting, cistern | 5 gal | ½ kW to 1 kW | White with blue bands | £23 0 0 | £8 19 5 |
| | L.B.T. | Wall mounting, cistern | 7½ gal | ¾ kW or 1 kW | White with blue bands | £27 10 0 | £10 14 6 |
| | G.B.T. | Wall mounting, cistern | 12 gal | 1 kW to 1½ kW | White with blue bands | £30 10 0 | £11 17 11 |
| | D.B.T. | Wall mounting, cistern | 15 gal | 1½ kW | White with blue bands | £33 10 0 | £13 1 4 |
| | U.D.B.–B.T. | Wall mounting or floor mounting, cistern | 20 gal | 2 kW or 3 kW | White with blue bands | £37 0 0 | £14 8 8 |
| | U.D.B.–B.T. | Wall mounting or floor mounting, cistern | 30 gal | 2 kW or 3 kW | White with blue bands | £42 10 0 | £16 11 6 |

* The purchase tax figures shown are subject to an increase of 20 per cent

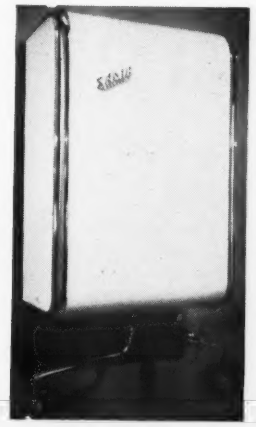
THERMAL STORAGE WATER HEATERS . . . . . *continued*

| Manufacturer | Name or Model | Type | Capacity | Loading | Finish | Price (excl. tax) | Purchase Tax* |
|---|---|---|---|---|---|---|---|
| **BERRY'S ELECTRIC, LTD.,** Touchbutton House, Newman Street, London, W.1. | " New Look " | Sink or basin | 1½ gal | 750 W | White, cream, blue or green | £12 17 6 (a.c.) £13 16 6 (d.c.) | £5 0 4 (a.c.) £5 7 10 (d.c.) |
| | " New Look " | Sink or basin | 1½ gal | 1 kW | White, cream, blue or green | £15 7 6 (a.c.) £16 6 6 (d.c.) | £5 19 10 (a.c.) £6 7 3 (d.c.) |
| **BRITISH NATIONAL ELECTRICS, LTD.,** Newarthill, Motherwell, Lanarkshire. | — | Non-pressure | 1½ gal | 750 W | White stoved enamel, chromium fittings | £10 10 0 | £4 1 11 |
| | — | Non-pressure | 3 gal | 1 kW | White stoved enamel, chromium fittings | £12 10 0 | £4 17 6 |
| | " Twin " | Dual-purpose | 6 gal or 20 gal | 500 W and 2½ kW | Mottled grey (*a*) and white (*b*) | £27 6 0 (*a*) £28 7 0 (*b*) | £10 13 0 (*a*) £11 1 2 (*b*) |
| | " Twin " | Dual-purpose | 6 gal or 30 gal | 500 W and 2½ kW | Mottled grey (*a*) and white (*b*) | £30 19 6 (*a*) £32 0 6 (*b*) | £12 1 8 (*a*) £12 9 10 (*b*) |
| **ELTRON (LONDON), LTD.,** Accrington Works, Strathmore Road, Croydon, Surrey. | S.N.3 | Small. Non-pressure under basin | ¾ gal | 1 kW | White enamel | £9 15 0 | £3 11 6 |
| | E.B.5 | Overflow wall mounting | 1½ gal | 2 kW | White enamel | £14 10 0 | £5 6 4 |

* The purchase tax figures shown are subject to an increase of 20 per cent



*Aidas 20 gal U.D.B. floor-mounting model*



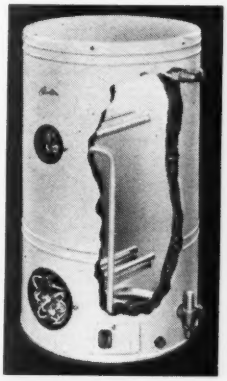
*Aidas " Select " water heater*

*Berry's 1½ gal " New Look " water heater*

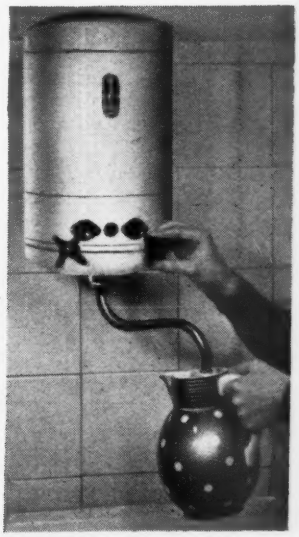
*Right : G.E.C. DE.700 1½ gal sink heater*

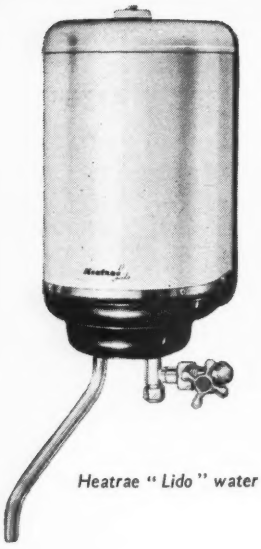
*B.N.E. non-pressure type water heater*

*Cut-away view of the B.N.E. " Twin " dual-purpose water heater*

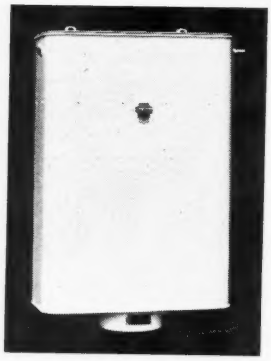


*Right : Eltron " E.B.5 " 1½ gal water heater*

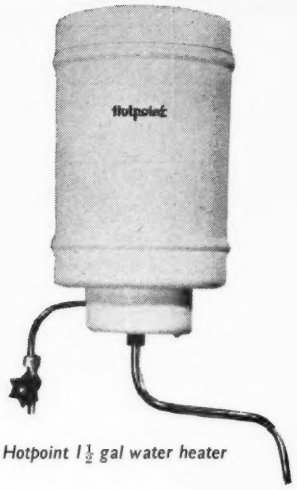




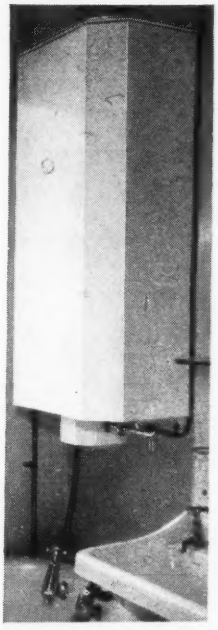
Heatrae "Lido" water heater



Heatrae type F.B. cistern water heater

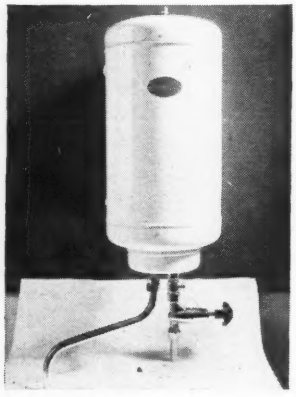



Hotpoint 1½ gal water heater

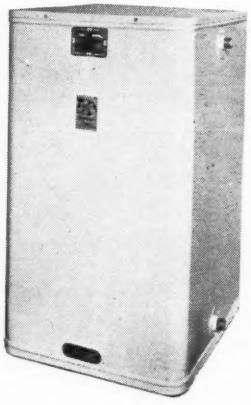


W. H. Smith "Eziot" B.W.T. cistern type water heater

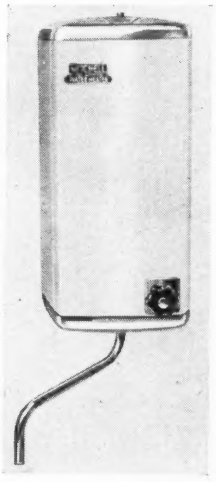
Santon wall-mounting water heater



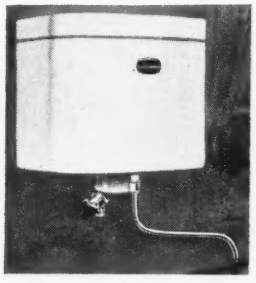
Santon "Monmouth" dual-purpose model



Mitchell "Streamline" water heater



Simplex Creda C135 "Crusader" 3 gal water heater



| Manufacturer | Name or Model | Type | Capacity | Loading | Finish | Price (excl. tax) | Purchase Tax* |
|---|---|---|---|---|---|---|---|
| GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. | DE.700 | Non-pressure (single-point) | 1½ gal | 1 kW | White stoved enamel | £12 12 0 | £4 18 3 |
| | DE.823 | Non-pressure (single-point) | 3 gal | 1 kW | White stoved enamel | £15 12 0 | £6 1 8 |
| | DE.705 | Non-pressure (single-point) | 5 gal | 1 kW | White stoved enamel | £19 15 0 | £7 14 1 |
| | DE.710 | Non-pressure (single-point) | 12 gal | 1½ kW | White stoved enamel | £29 15 0 | £11 12 1 |
| | DE.715 | Pressure (multi-point) | 15 gal | 1½ kW | White stoved enamel | £19 15 0 | £7 14 1 |
| | DE.726 | Cistern | 15 gal | 1½ kW | White stoved enamel | £39 7 6 | £15 7 1 |
| | DE.727 | Cistern | 20 gal | 2 kW | White stoved enamel | £45 12 6 | £17 15 11 |
| | DE.730 | Pressure (multi-point) | 30 gal | 3 kW | White stoved enamel | £51 10 0 | £20 1 8 |
| | DE.790 | Dual heat (multi-point) | 20 gal | 3 kW | White or grey stoved enamel | £30 3 0 | £11 15 2 |
| HEATRAE, LTD., Heatrae Works, Norwich. | "Lido" | Non-pressure | 1½ gal (*a*) or 3 gal (*b*) | 750 W and 1 kW (*a*) or 1 kW and 2 kW (*b*) | White, cream, blue or green | £10 5 0 (*a*) £11 15 0 (*b*) | £4 0 0 (*a*) £4 11 8 (*b*) |

* The purchase tax figures shown are subject to an increase of 20 per cent

## THERMAL STORAGE WATER HEATERS . . . . . *continued*

| Manufacturer | Name or Model | Type | Capacity | Loading | Finish | Price (excl. tax) | Purchase Tax* |
|---|---|---|---|---|---|---|---|
| **HEATRAE, LTD.,** Heatrae Works, Norwich. *(continued)* | F.B. | Cistern | 5 to 30 gal | 1 to 3 kW | White or cream | £28 10 0 to £61 13 0 | £11 2 4 to £24 0 11 |
| | R.T.A. | Non-pressure | 5 to 20 gal | 1 to 2 kW | White or cream | £18 15 0 to £37 18 0 | £7 6 3 to £14 15 8 |
| | S.E.B. | Quick service | 12 gal | 4 kW | White or cream | £29 8 0 | £11 9 0 |
| **THE HOTPOINT ELECTRIC APPLIANCE CO., LTD.,** Fletton, Peterborough. | NA.2A | Wall mounting | 1½ gal | 750 W | Stoved enamel | £12 12 0 | £4 18 4 |
| | "Dulec" | Floor mounting | 20 gal | 3 kW | Stoved enamel | £27 6 0 | £10 13 0 |
| **MITCHELL ELECTRIC, LTD.,** 88-90, Tennant Street, Birmingham, 15. | "Streamline" | Non-pressure | 1½ gal | 750 W | White, cream, blue or green | £12 15 0 | £4 19 5 |
| | "Streamline" | Non-pressure | 3 gal | 1 kW | White, cream, blue or green | £14 4 6 | £5 11 0 |
| **SANTON, LTD.,** Somerton Works, Newport, Mon. | NPT | Non-pressure | 1½ to 15 gal | 750 W to 1½ kW | White enamel | £12 12 0 to £33 17 6 | £4 18 3 to £13 4 3 |
| | PT | Pressure, wall mounting | 5 to 20 gal | 1 to 2 kW | White enamel | £17 0 0 to £37 15 0 | £6 12 7 to £14 14 6 |
| | PT/FM | Pressure, floor mounting | 20 gal (*a*) and 30 gal (*b*) | 2 kW (*a*) and 3 kW (*b*) | White enamel | £53 10 0 (*a*) £65 0 0 (*b*) | £20 17 4 (*a*) £25 7 0 (*b*) |
| | DF | Cistern, wall mounting | 5 to 20 gal | 1 to 2 kW | White enamel | £26 5 0 to £45 12 6 | £10 4 9 to £17 15 11 |
| | DF/FM | Cistern, floor mounting | 20 gal (*a*) and 30 gal (*b*) | 2 kW (*a*) and 3 kW (*b*) | White enamel | £64 0 0 (*a*) £76 0 0 (*b*) | £24 19 3 (*a*) £29 12 10 (*b*) |
| | DF/R | Rectangular, cistern, wall mounting | 5 gal (*a*) and 12 gal (*b*) | 1 kW | White enamel | £33 17 6 (*a*) On application (*b*) | £13 4 3 (*a*) (*b*) |
| | NPT/E | Non-pressure, wall mounting | 12 gal (*a*) and 15 gal (*b*) | 1½ kW | White enamel | £29 15 0 (*a*) £33 17 6 (*b*) | £11 12 1 (*a*) £13 4 3 (*b*) |
| | PT/E | Pressure, wall mounting | 12 to 20 gal | 1½ and 2 kW | White enamel | £26 12 6 to £32 0 0 | £10 7 8 to £12 9 7 |
| | PT/EFM | Pressure, floor mounting | 20 gal (*a*) and 30 gal (*b*) | 3 kW | White enamel | £42 0 0 (*a*) £51 10 0 (*b*) | £16 7 7 (*a*) £20 1 8 (*b*) |
| | DF/E | Cistern, wall mounting | 12 to 20 gal | 1½ and 2 kW | White enamel | £35 15 0 to £42 10 0 | £13 18 10 to £16 11 6 |
| | DF/EFM | Cistern, floor mounting | 20 gal (*a*) and 30 gal (*b*) | 3 kW | White enamel | £52 0 0 (*a*) £60 0 0 (*b*) | £20 5 7 (*a*) £23 8 0 (*b*) |
| | "Monmouth" | Automatic dual | 12 gal (*a*) and 20 gal (*b*) | Top: 1 kW Bottom: 2 or 3 kW | Cream enamel | £29 5 0 (*a*) £32 0 0 (*b*) | £11 8 2 (*a*) £12 9 7 (*b*) |
| **SIMPLEX ELECTRIC, LTD.,** Blythe Bridge, Stoke-on-Trent, Staffs. | "Crusader" C13S | Non-pressure | 3 gal | 2 kW | White and cream | £10 10 0 | £4 1 11 |
| | C7503 | Non-pressure | 3 gal | 1 kW | White | £13 18 3 | £5 8 6 |
| | C7505 | Non-pressure | 5 gal | 1 kW | White | £16 17 10 | £6 11 9 |
| | C7505BR | Cistern | 5 gal | 1 kW | White | £23 2 0 | £9 0 2 |
| | C7512P | Pressure | 12 gal | 1½ kW | White | £23 7 3 | £9 2 3 |
| | C7512 | Non-pressure | 12 gal | 1½ kW | White | £24 8 3 | £9 10 5 |
| | C7512BR | Cistern | 12 gal | 1½ kW | White | £33 9 11 | £13 1 3 |
| | "Dulec" | Dual purpose | 18·7 gal | 3 kW | Grey (*a*) and white (*b*) | £27 6 0 (*a*) £28 7 0 (*b*) | £10 13 0 (*a*) £11 1 2 (*b*) |
| **W. H. SMITH (EZIOT), LTD.,** 32, Mansfield Street, Church Gate, Leicester. | "Eziot" WT | Non-pressure | 1½ gal | 750 W | White or cream, etc. | £10 5 0 | £4 0 0 |
| | "Eziot" WT | Non-pressure | 2 to 2½ gal | 1 kW | White or cream, etc. | £10 15 0 | £4 3 10 |
| | "Eziot" BWT | Built-in cistern | 12 gal | 1½ kW | White or cream, etc. | £36 6 6 | £14 3 4 |

* The purchase tax figures shown are subject to an increase of 20 per cent

# GENERATION AND DEVELOPMENT

### *British Consultants for Aswan Dam*

It was announced in Cairo last week that the Egyptian Government had engaged Sir Alexander Gibb & Partners as consultants for the Aswan Dam irrigation and hydro-electric scheme, which is estimated to cost over £200 million. Several nations, including Russia, have expressed their willingness to provide equipment and labour for the scheme. The World Bank has been asked for a loan and a consortium of British, French and West German banks has offered to raise £45 million towards the cost.

### *Nuclear Plant Contract*

A contract for the main civil engineering and building work at the projected Chapel Cross atomic power station of the Atomic Energy Authority at Annan, Dumfriesshire, has been placed with the Mitchell Construction Co., Ltd. The work is expected to cost about £3½ million.

### *London Division Brochure*

For the information of visitors, home and overseas, the London Division of the Central Electricity Authority has produced a handsome illustrated brochure describing its constitution and operations. The scope of this Division is indicated in the introduction which mentions that it operates 37 power stations with a total capacity of nearly 4,000 MW and is responsible for 480 circuit miles of main transmission lines; it employs 9,500 people.

### *Site for Sub-Area Headquarters*

For the purpose of establishing new Sub-Area headquarters, District offices and depot, the Midlands Electricity Board has acquired eight acres of the former Malvern Hall Hostel property.

### *More Power for the Congo*

The *Financial Times* reports that the official inauguration last week of a 21,000 kW hydro-electric station on the Inkisi River at Zongo, in the Belgian Congo, will, it is hoped, end the acute shortage of power in the Leopoldville area. When the first set was started up in August it was possible for part of the electrical installations in the native quarter to be connected and for the new gyro-buses to give the city its first public transport. Plans are already being made for another station, Zongo 2, further down the river.

### *Bolivian Hydro-Electric Scheme*

Consideration is being given to a 70,000 kW hydro-electric development on the River Negro, 27 km from Montepuncu. It would require the construction of a tunnel 2,800 metres long, giving a head of 900 m, said to be the highest in South America. Power would be supplied to Cochabamba and the neighbouring tin and wolfram mines. The cost is estimated at $U.S.14 million.

### *Glasgow Transport Discussions*

According to the *Financial Times* correspondent, the prospects of agreement being reached between Glasgow Corporation and the British Transport Commission on the latter's £11 million scheme for electrifying the city and district railways were advanced a stage last week when Corporation representatives agreed to abandon the operation of tram routes outside the city. Detailed proposals to be submitted to the Glasgow Passenger Transport Joint Committee include the closing down of the Airdrie and Paisley tram routes.

### *Profit on Trolley-buses*

During the year ended 31st March last South Shields Corporation trolley-bus services made a net profit of £16,332 and, after deducting a loss of £1,723 made by the motor-buses, there was a net profit on the joint undertaking of £14,609, the highest since the transport undertaking was started in 1906. The Corporation has 60 trolley-buses.

### *Railway Electrification in Australia*

Speaking at the official opening of the Penrith-Blacktown electric railway, Mr. J. J. Cahill, Premier of New South Wales, said that the western line should be electrified to Katoomba by next April and to Mount Victoria by next July. When the scheme was finished passengers would be saved more than an hour in travelling time to Sydney. On the run from the Blue Mountains to Sydney the trains would generate electricity and feed it back into the overhead system.

In Victoria, the first electric train recently made the journey from Yallourn, site of the State brown coal mine, to Melbourne. Completion of the electrification to Yallourn gives Victoria the longest electric route in Australia. Next year it will be extended to Morwell in the Latrobe Valley.

### *Trafalgar Day Celebrations*

To celebrate the 150th anniversary of Trafalgar Day on 21st October, the Admiralty arranged the floodlighting for three nights of the *President* and *Discovery*, two well-known ships on the Thames. Six "Royston" and "Drayton" wide angle floodlights were used to illuminate the hull of each ship, and they were mounted on special brackets temporarily attached to the Embankment wall.

*The "Discovery" floodlit during the Trafalgar Day Celebrations*

To lighten shadows cast by these main floodlights, two floods were secured to each pontoon, and in the case of the *Discovery*, narrow angle projectors were used to pick out the masts. For highlighting the radar mast and funnel of the *President*, a mixture of wide and medium angle floodlights were mounted in-board ship. The floodlighting scheme was devised by Siemens Electric Lamps & Supplies, Ltd., whose fittings and lamps were used exclusively.

### *Street Lighting Plans*

Alternative schemes for main road lighting between Norbury and Purley were recently considered by the CROYDON Highways and Street Services Committee. The Committee stated that central suspension (350 positions) would cost about £39,370, while staggered lamps (267 positions) would cost £23,276. It was recommended that the latter scheme, which would conform with the lighting at Streatham and with that proposed in Purley, should be adopted.

To cover the cost of the conversion from gas to electricity of 1,680 street lamps, PLYMOUTH City Council is seeking sanction to borrow £64,210.

A scheme submitted by the borough surveyor of GUILDFORD for Class "A" lighting in Epsom Road, at an estimated cost of £10,000, is recommended for approval.

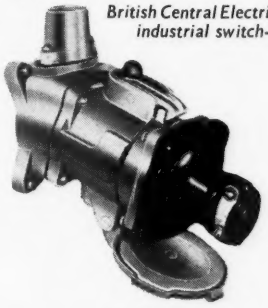
ROCHDALE Corporation is applying for permission to borrow £11,015 for the conversion of gas street lighting to sodium lighting on the Brimrod and Kilworth estates.

DEWSBURY Borough Council is seeking the Minister of Transport's approval to a £10,792 scheme for conversion of lighting on main roads and bus routes to sodium lighting.

# NEW ELECTRICAL EQUIPMENT

## Switch-Plug

An industrial switch-plug available from the BRITISH CENTRAL ELECTRICAL CO., LTD., 6 & 8, Rosebery Avenue, London, E.C.1, in 8, 16, 32, 64 and 124 A sizes, enables users to standardize safely on one type of plug and socket for all power supplies installed (400 V, three-phase 50 c/s; 110 V d.c., etc.). Breaking arcs are quenched in individual extinction chambers. Plugs up to 32 A size can have each of their spring contacts replaced by individual



*British Central Electrical Co.'s industrial switch-plug*

fuse units. Slight pressure on an insulated button actuates a spring-loaded pawl on the socket, ejecting the plug from intimate contact and thus breaking the circuit, which may be on load, virtually instantaneously; the plug remains semi-captive.

All units are robust and armoured against misuse or rough handling. A sprung weatherproof shutter seals the outlet socket. The plugs are tapped in e.t. sizes, and are suitable for direct wall mounting, or bolting to distribution box, busbar chamber, etc.

## Convector Heaters

The range of electric convector heaters announced by CROSSLANDS (RUGELEY), LTD., 55, Ebury Street, London, S.W.1, for the 1955-56 season is not only attractive in design but competitively priced. Three models are available; the first (900/1) is rated at 1 kW and the 900/2 and 900/3 models at 2 kW each. A two-heat a.c./d.c. switch is incorporated in the 900/2 model, whereas the 900/3 is provided with a three-heat switch for use on a.c. only.

*Crossland convector heater*

The convectors are attractively finished in either hammered old gold or hammered antique bronze, and measure 22½in high by 23½in wide; the depth tapers from 3¾in at the top to 5in and across the feet the measurement is 9in. The total weight is 24 lb and all models are supplied with colour sprayed lamps for glow lighting effect and 6ft of three-core flexible.

The voltage range is 200/220 and 230/250, and the prices are £6 5s (900/1), £7 12s 6d (900/2) and £8 10s (900/3), plus £2 14s 2d, £3 6s and £3 13s 8d, respectively, for purchase tax in the United Kingdom.

## Washing Machine

HOOVER, LTD., 211-213, Regent Street, London, W.1, announce that the Mark II washing machine with heater, which was introduced at first in Scotland and then progressively in other parts of Britain, is now on sale throughout the United Kingdom.

## Cable Marking

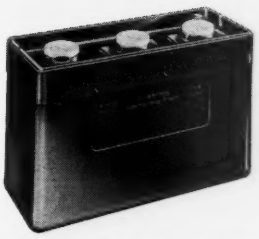
A new method of marking p.v.c. cables is announced by the MURRAY-HILL CO., Link Hill, Sandhurst, Hawkhurst, Kent, which has recently introduced p.v.c. decals in the form of a transfer that differs from the conventional type in that the letters themselves are also the adhesive. A solvent, the main constituent of which is cyclohexanone, is applied to the cable, causing the skin to dissolve to some extent. Whilst still wet the decal is applied and a firm bond is established. The backing paper can be removed almost immediately and a clear marking is left. For additional protection transparent varnish may be applied. Cables are ready for immediate use after the decal is applied although maximum hardness is not attained for twenty-four hours.

The decals are available in all colours and are unaffected by petrol and oils. Usually they are manufactured only to customers' specifications but sheets of letters and numbers in 24 and 12 point type are available from stock.

## Fence Battery

A 6 V electric fence battery, the "Dagenite" 3-LF3, is now available from HOLSUN BATTERIES, LTD., 137, Victoria Street, London, S.W.1. Among its special features are a tough, one-piece moulded container; large filling orifices; colour coded, non-interchangeable terminals; and fully shrouded live connections to prevent accidental short-circuits.

No loss of acid occurs if the battery is knocked over because the interior of



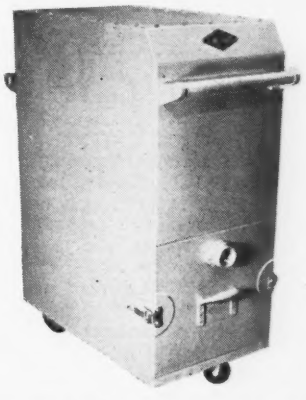
*"Dagenite" 3-LF3 fence battery*

each cell is almost completely filled with diatomite, a powdery substance that completely absorbs the acid electrolyte. The separators are of "Porvic." With a capacity of 20 Ah at the 100 hr rate, the battery weighs 15 lb (fully charged) and measures 9 5/16 in long by 6 1/16 in high by 3⅝in wide. The list price is £3 12s 6d.

## Industrial Vacuum Cleaner

The Powervac EME.99, now in production, is a heavy duty industrial vacuum cleaner built to post-war design by POWERVACS, LTD., 6, Cockhill, London, E.1. It incorporates the new "FAF" automatic filter and has many advantages over its predecessors. The removal of very fine powders is possible with this machine on account of the automatic self-cleaning action of the filter.

Dust is collected into a large capacity and easily removable metal bin, the air flowing freely and unrestricted through a vertical filter which is being constantly agitated, this completely eliminating any possibility of clogging. Glass, swarf or metal fragments are discharged direct into the metal bin which prevents damage to the filter unit. The multi-stage turbo-exhauster, with a ¾ h.p. universal motor and automatic filter unit, is enclosed in a steel container of great rigidity and preventing damage by even the most careless operator. The unit is compact and mounted on two 7in rubber tyred wheels and a swivel ball bearing castor, enabling it to be easily wheeled between gangways. It can instantly be converted for blowing.



*Powervac EME.99 heavy duty industrial vacuum cleaner*

# South Africa's Power Needs

## *Progress of Plant Extension Programme*

WHAT has been accomplished by the South African Electricity Supply Commission in its "paramount task"—procuring increased generating capacity to meet the rapidly growing needs in all provinces, especially in the area of the newly discovered goldfields—is reviewed in the Commission's latest report. This shows that since the war there has been a net increase in power plant available of 835 MW (equal to an expansion of 78 per cent) but this figure is exceeded by the aggregate plant capacity now under construction or on order, which amounts to 930 MW. Capital expenditure on plant and works last year totalled £25 million.

Though delays were again caused by shortages of materials and labour, the Commission was last year able to commence generating at three new power stations, namely, Umgeni (Natal), Taaibos and Wilge (Rand). In addition, the first set at the Salt River No. 2 station, Cape Town, was ready for service at the end of April last and the first boiler at the West Bank No. 2 station, East London, was almost ready for steaming. By closer working between certain of the Commission's undertakings substantial savings in capital outlay on new plant are anticipated; in the case of the Natal Southern and Central undertakings, for instance, it is calculated that there will be a saving of the order of £4,500,000 over a period of five years.

As shown in the accompanying table, 10,652 million kWh was generated last year, the increase of 1,200 million kWh (12·8 per cent) being the largest in the Commission's history. Between them the Klip and Vaal stations (2,871 and 2,326 million kWh, respectively) accounted for about half of the total electricity generated. The former had a station load factor of 79 per cent and a thermal efficiency (kWh sent out) of 21·21 per cent. Coal cost 13s 1d a ton of 2,000 lb against 11s 7d in 1953, 1·669 lb being used per kWh sent out. At the Vaal station, which had a load factor of 86 per cent and a thermal efficiency of 22·9 per cent, 1·659 lb of coal was used per kWh sent out, the fuel cost remaining at 6s 10d a ton as in the previous year. In thermal efficiency the new Taaibos station held the leading position (24·83 per cent), followed by Hex River (24·34 per cent).

Sales totalled 9,677 million kWh, well over half going to the mining industry. During the year the transmission and distribution systems were increased from 8,472 to 8,836 circuit miles.

**Revenue, Production Costs and Output**

| | 1953 | 1954 | Inc./dec. % |
|---|---|---|---|
| Total revenue ... ... ... | £15·5 million | £18·5 million | + 19·1 |
| Production costs, inc. interest, etc., charges ... ... ... | £15·5 million | £18·4 million | + 18·6 |
| Average pric per kWh sold ... | 0·43d | 0·46d | + 7·5 |
| Plant capacit MW* ... ... | 1,899 | 2,124 | + 11·8 |
| Electricity ge erated, million kWh | 9,442 | 10,652 | + 12·8 |
| Electricity purchased, million kWh | 550 | 437 | − 20·5 |
| Electricity sold, million kWh ... | 8,732 | 9,677 | + 10·8 |
| Coal consumed, million tons (2,000 lb) ... ... ... | 8·2 | 8·8 | + 8·5 |
| Cost of coal, inc. railage ... ... | £4·9 | £5·7 | + 14·9 |

* Including steam and compressed air stations.

# New Jackson Fires

THE Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1, announce their return to the electric fire market with the introduction of five attractive new models. The range includes two low-priced portable fires, an all chrome portable fire, an inset fire and a panel fire.

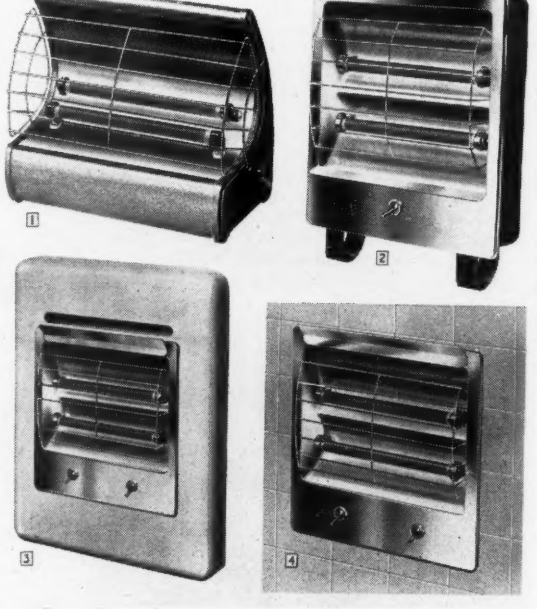
The 731J and 732J models are available in 1 and 2 kW loadings respectively, the latter being fitted with a switch for half heat. The highly polished reflector, designed to give the widest possible distribution of heat, is mounted in a pressed steel body and a heavily plated safety guard is fitted. Both models have a golden russet finish and measure 12in wide by 11⅛in high. The 731J model is priced at £2 12s 6d, plus £1 3s 1d for purchase tax in the United Kingdom, and the 732J costs £3 10s, plus £1 10s 8d tax.

The 253J model incorporates two 1 kW rod elements controlled by a d.p. switch. The one-piece front and reflector are finished in heavy chromium plating neatly set off by the black feet and handle. This fire is 12⅝in wide by 14¾in high and is priced at £4 17s 6d, plus £2 2s 10d tax.

The inset fire (251J) is also an all chromium model and has been designed to blend with any decoration or colour scheme. The two 1 kW elements are controlled by one d.p. and one s.p. switch mounted on the front of the panel, and a plated wire guard gives adequate protection. The model is 12⅝in square and is designed to fit in a surround opening measuring 12in square by 2⅝in deep. The price is £4 10s, plus £1 19s 6d tax.

The panel version, model 252J, has a heavy chromium reflector set in a mushroom stoved enamel panel, and the special "air flow" convection system provides a warm current of air from an opening above the fire. Two similar switches as fitted to the 251J are provided, controlling the two 1 kW elements. The fire is simply fixed to the wall by four concealed screws. The price is £5 5s, plus £2 6s 1d purchase tax.

The standard voltage range for all the foregoing fires is 230/240 V, but other voltages may be obtained.




*Four of the new Jackson range of fires: (1) 732J, (2) 253J, (3) 252J, (4) 251J*

# Electrical Engineers' Exhibition

*From the general manager of the Electrical Engineers' (A.S.E.E.) Exhibition (Mr. P. A. Thorogood) we have received a list of companies and other organizations which will have stands at next year's exhibition (Earls Court, 20th-24th March). As will be seen from the list (reproduced below) there are nearly 300 exhibitors*

## LIST OF EXHIBITORS

A.C.-Delco Division of General Motors, Ltd.
Acral, Ltd.
Aerialite, Ltd.
Aero Research, Ltd.
Agro Electrical Co., Ltd.
Allen West & Co., Ltd.
Alorite, Ltd.
Arrow Electric Switches, Ltd.
Ashley Accessories, Ltd.
Association of Supervising Electrical Engineers
Astral Equipment, Ltd.
Astral Switchgear, Ltd.
Automatic Coil Winder & Electrical Equipment Co., Ltd.
Backer Electric Co., Ltd.
Bakelite, Ltd.
Baldwin (H. J.) & Co., Ltd.
Battery Construction, Ltd.
Beckett & Parker, Ltd.
Belmos Co., Ltd.
Benjamin Electric, Ltd.
Bescol (Electric), Ltd.
Besson & Robinson, Ltd.
Beta Manufacturing Co.
Bill Switchgear, Ltd.
Blackwell (F. C.) & Co., Ltd.
Bolton (Thomas) & Sons, Ltd.
Bourner (F. H.) & Co. (Engineers), Ltd.
Bowker (S. O.), Ltd.
Bowthorpe Electric Co., Ltd.
Bray (Geo.) & Co., Ltd.
British Central Electrical Co., Ltd.
British Electric Lamps, Ltd.
British Electric Resistance Co., Ltd.
British Electrical & Allied Industries Research Association
British Electrical Development Association
British Electrical Repairs, Ltd.
British Insulated Callender's Cables, Ltd.
British Klockner Switchgear, Ltd.
British Physical Laboratories
British Standards Institution
British Thomson-Houston Co., Ltd.
Britmac Electrical Co., Ltd.
Brook Motors, Ltd.
Brookhirst Switchgear, Ltd.
Browning's Electric Co., Ltd.
Brush Electrical Engineering Co., Ltd.
Bryce Electric Construction Co., Ltd.
Bulpitt & Sons, Ltd.
Burgess Products Co., Ltd.
Cable Makers' Association
Cantie Switches, Ltd.
Cayson Electric, Ltd.
Central Electricity Authority
Channel Conduits, Ltd.
Chapman & Hall, Ltd.
Chilton Electric Products, Ltd.
Chloride Batteries, Ltd.
Clang, Ltd.
Clare Instrument Co.
Clarke (H.) & Co. (Manchester), Ltd.
Cole (E. K.), Ltd.
Concordia Electric Wire & Cable Co., Ltd.
Connollys (Blackley), Ltd.
Contactum, Ltd.
Copper Development Association
Coupleflex, Ltd.
Courtney, Pope (Electrical), Ltd.
Crabtree (J. A.) & Co., Ltd.
Critchley Bros., Ltd.
Crompton Parkinson, Ltd.
Crypto, Ltd.
Crypton Equipment, Ltd.
Davis Sheet Metal Engineering Co., Ltd.
Delta Technical Services, Ltd.
Dennis (G. P.), Ltd.
Dexion, Ltd.
"Diamond H" Switches, Ltd.
Dimplex, Ltd.
Donovan Electrical Co., Ltd.
Dorman & Smith, Ltd.
Dowding & Mills, Ltd.
Dowty Group, Ltd.
D.P. Battery Co., Ltd.
D.S. Plugs, Ltd.
Dubilier Condenser Company (1925), Ltd.
Edison Swan Electric Co., Ltd.
E.F. Electric, Ltd.
Ega Electric, Ltd.
Ekco-Ensign Electric, Ltd.
Electric Construction Co., Ltd.
Electrical Apparatus Co., Ltd.
Electrical Association for Women
Electrical Industries Benevolent Association
*Electrical Industries Export*
*Electrical Journal*
Electrical Remote Control Co., Ltd.
*Electrical Review*
*Electrical Times*
Electro Dynamic Construction Co., Ltd.
Electro Mechanical Manufacturing, Ltd.
Elliott Brothers (London), Ltd.
Ellison (George), Ltd.
E.M.B. Co., Ltd.
E.M.I. Electronics, Ltd.
E.M.S. Electrical Products, Ltd.
Enfield Cables, Ltd.
Engel & Gibbs, Ltd.
Engineering & Lighting Equipment Co., Ltd.
English Electric Co., Ltd.
Erskine, Heap & Co., Ltd.
Everett, Edgcumbe & Co., Ltd.
Evershed & Vignoles, Ltd.
Expanded Metal Co., Ltd.
Falk, Stadelmann & Co., Ltd.
Fenton, Byrn & Co., Ltd.
Ferguson, Pailin, Ltd.
Ferranti, Ltd.
Fitzgibbon & Murray, Ltd.
Foster Transformers, Ltd.
Fractional H.P. Motors, Ltd.
Friedland (V. & E.), Ltd.
G.B.M. (Electrical) Birmingham
General Electric Co., Ltd.
Gent & Co., Ltd.
Gillott Electro Appliances, Ltd.
Griffiths Bros. & Co. (London), Ltd.
Gulf Oil (Great Britain), Ltd.
G.W.B. Furnaces, Ltd.
Hall (J. Edwards) (Electrical Engineers), Ltd.
Harris & Sheldon (Electrical), Ltd.
Hawkins (L. G.) & Co., Ltd.
Heatovent Electric, Ltd.
Heatrae, Ltd.
Heayberd (F. C.) & Co., Ltd.
Hedin, Ltd.
Heenan & Froude, Ltd.
Henley's (W. T.) Telegraph Works Co., Ltd.
Herbert Publishing Co., Ltd.
Herman Smith (Smithlite), Ltd.
Hirst Electronic Development, Ltd.
Holophane, Ltd.
Hoover, Ltd.
Hotpoint Electric Appliance Co., Ltd.
Household Electrix, Ltd.
Howell (V. G.) & Co., Ltd.
Hunt (A. H.) (Capacitors), Ltd.
I.B.M. United Kingdom, Ltd.
Igranic Electric Co., Ltd.
Imperial Chemical Industries, Ltd.
Jeary Electrical Co., Ltd.
Johns-Manville Co., Ltd.
Johnson (Richard) & Nephew, Ltd.
Johnson & Phillips, Ltd.
Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd.
Kersons Manufacturing Co., Ltd.
Kilpatrick (James) & Sons, Ltd.
Klaxon, Ltd.
Lancashire Dynamo & Crypto, Ltd.
Lancashire Dynamo Electronic Products, Ltd.
Lancashire Dynamo Switchgear, Ltd.
Langley London, Ltd.
Laurence, Scott & Electromotors, Ltd.
Lewden Metal Products, Ltd.
Lewis (H. K.) & Co., Ltd.
Light and Power Accessories Co., Ltd.
Line Equipment, Ltd.
Linolite, Ltd.
Liverpool Electric Cable Co., Ltd.
Loblite, Ltd.
Londex, Ltd.
London Electric Wire Co. and Smiths, Ltd.
London Transformer Products, Ltd.
Longlamps, Ltd.
Lossos (M. & J.) & Co., Ltd.
Lumitron, Ltd.
Luxram Electric, Ltd.
Lyon (Arthur) & Co., Ltd.
McGeoch (William) & Co., Ltd.
Maclaren (Robert) & Co., Ltd.
Major Equipment Co., Ltd.
Mantel Metalworkers, Ltd.
Marbourn, Ltd.
Marryat & Place, Ltd.
Martindale Electric Co., Ltd.
Max Arc & Electrics, Ltd.
M. & C. Switchgear, Ltd.
M.C.B. Co. (Manchester), Ltd.
Measuring Instruments (Pullin), Ltd.
Merchant Adventurers of London, Ltd.
Merlin Mouldings, Ltd.
Metropolitan-Vickers Electrical Co., Ltd.
Meteway Electrical Industries, Ltd.
Micanite & Insulators Co., Ltd.
Midland Electric Manufacturing Co., Ltd.
Midland Silicones, Ltd.
M.K. Electric, Ltd.
Mycalex and T.I.M., Ltd.
Nalder Bros. & Thompson, Ltd.
Nettle Accessories, Ltd.
Nevelin Electric Co., Ltd.
New Day Electrical Accessories, Ltd.
Newman Industries, Ltd.
Nife Batteries
Oldham & Son, Ltd.
Oliver Pell Control, Ltd.
Otter Controls, Ltd.
Ottermill Switchgear, Ltd.
Parmiter. Hope & Sugden, Ltd.
Parnall (Yate), Ltd.
Partridge, Wilson & Co., Ltd.
Permali, Ltd.
Permanoid, Ltd.
Philips Electrical, Ltd.
Pirelli-General Cable Works, Ltd.
Poles, Ltd.
Porter Electrical Products, Ltd.
Power Centre Co., Ltd.
Power Connectors, Ltd.
Process Control Gear, Ltd.
Pyrotenax, Ltd.
Quickdraw Co., Ltd.
Ranton & Co., Ltd.
Rawlplug Co., Ltd.
Record Electrical Co., Ltd.
Resinoid & Mica Products, Ltd.
Revo Electric Co., Ltd.
Reyrolle (A.) & Co., Ltd.
Rheostatic Co., Ltd.
Rolls Switches, Ltd.
Rooster Publicity, Ltd.
Ross Courtney & Co., Ltd.
Rowlands Electrical Accessories, Ltd.
Runbaken Electrical Products
Sanders (Wm.) & Co. (Wednesbury), Ltd.
Sangamo Weston, Ltd.
Sankey (Joseph) & Sons, Ltd.
Santon, Ltd.
Scholes (George H.) & Co., Ltd.
Scottish Cables, Ltd.
Siemens Electric Lamps & Supplies, Ltd.
Siemens-Schuckert (Gt. Britain), Ltd.
Simplex Electric Co., Ltd.
Slough Metals, Ltd.
S.L.R. Electric, Ltd.
Small Electric Motors, Ltd.
Smith (Frederick) & Co.
South Wales Switchgear, Ltd.
Square D, Ltd.
Standard Telephones and Cables, Ltd.
Statter (J. G.) & Co., Ltd.
Sterling Cable Co., Ltd.
Sun Electrical Co., Ltd.
Sunvic Controls, Ltd.
Symons (H. D.) & Co., Ltd.
Synchronome Co., Ltd.
Synthetic Carbon & Engineering Co., Ltd.
Tate Bros., Ltd.
Taylor (George E.) & Co. (London), Ltd.
Telegraph Condenser Co., Ltd.
Telegraph Construction and Maintenance Co., Ltd.
Tetra Engineering Co., Ltd.
Thermodare (Great Britain)
Thorn Electrical Industries, Ltd.
Thorpe (F. W.), Ltd.
T.M.C.-Harwell (Sales) Ltd.
Troughton & Young, Ltd.
Tucker (J. H.) & Co., Ltd.
Tudor Accumulator Co., Ltd.
Tufnol, Ltd.
Turners Asbestos Cement Co., Ltd.
Uni-Tubes, Ltd.
Vactite Wire Co., Ltd.
Varilectric, Ltd.
Veritys, Ltd.
Volex Electrical Products, Ltd.
Walker (W. G.) & Co. (Engineers), Ltd.
Walsall Conduits, Ltd.
Walterisation Co., Ltd.
Wandsworth Elec. Mfg. Co., Ltd.
Watford Electric & Mfg. Co., Ltd.
Watliff Co., Ltd.
Weir Electrical Instrument Co., Ltd.
Westinghouse Brake and Signal Co., Ltd.
Westool, Ltd.
Westwood Switchgear, Ltd.
Whipp & Bourne, Ltd.
Wiggin (Henry) & Co., Ltd.
Wilcox (Edward) & Co., Ltd.
William White (Switchgear), Ltd.
Woden Transformer Co., Ltd.
Wolf Electric Tools, Ltd.
Woods of Colchester, Ltd.
Yorkshire Switchgear & Engineering Co., Ltd.

## *Financial Section*

# STOCKS and SHARES

AFTER a good deal of fluctuation over the time of the supplementary Budget, the industrial markets of the Stock Exchange seemed to be finding a level somewhere between the lower points ruling previously, and those reached in the initial upward reaction to the Chancellor's proposals. The latter movement evidently registered relief at the absence of certain of the measures apprehended beforehand. It became modified by second thoughts about the implications of some of the steps taken. On balance, many electrical engineering and radio shares achieved useful recoveries. Dealings began in the 2,650,000 new B.I.C.C. ordinary shares at a premium of about 7s 3d on the price of 38s at which they are offered to stockholders. In the gilt-edged market the trend remained disappointing.

### Profits Tax

So far as the proposed increase to 27½ per cent in the tax on distributed profits is concerned, market impressions are that it is likely to exercise a restraining influence on dividend decisions to come. Present rates of dividend on the majority of good industrial shares are, however, regarded as conservative enough to avoid being placed in serious jeopardy as a result of it. A firm of dealers specializing in cable and telephone shares produces calculations to show that for most companies it would have meant a reduction of about 1 per cent in the earnings shown in the last published accounts as being available for dividends and reserves. According to their figures, a reduction at that rate would apply, for instance, to the last accounts of B.I.C.C., Henley's Telegraph and T. C. & M., and only a fraction more in the case of Automatic Telephone, London Electric Wire and Ericssons.

### Morphy-Richards

The full report issued by Morphy-Richards, covering the year ended in June, appeared on Budget day, so that the market impression made by the excellent account of affairs was complicated by the news of the increased purchase tax rates. In the event, the price of the 4s shares remained firm at around 28s 3d, showing a 7 per cent yield on the increased dividend of 50 per cent. The large expansion of earnings during a year of what the chairman describes as intense activity resulted from an increase of practically 50 per cent in total sales. These reached a value of almost £4 million, of which a quarter went overseas. Results for the first quarter of the current year are stated to show a substantial increase, but in to-day's circumstances the chairman finds it much too early to form any definite opinion about the year's outcome.

### S. Smith & Sons

The end of the Motor Show serves as a reminder that S. Smith & Sons (England) closed their financial year

## *The Week's Price Changes*

| Company or Board | Nom. Value | Middle price 31st Oct. | Week's Rise or Fall | Dividend Previous | Dividend Last | Yield % | 1955 Highest | 1955 Lowest |
|---|---|---|---|---|---|---|---|---|
| *Gilt-edged Stocks* | | | | | | £ s d | | |
| Brit. Elec. 1968/73 | 100 | 81½ | | 3 | 3 | 3 13 10 | 94⅜ | 76½ |
| Brit. Elec. 1974/77 | 100 | 80½ | | 3 | 3 | 3 14 6 | 93⅞ | 75½ |
| Brit. Elec. 1976/79 | 100 | 84½ | | 3½ | 3½ | 4 2 10 | 98⅜ | 80½ |
| Brit. Elec. 1974/79 | 100 | 95½ | | 4¼ | 4¼ | 4 16 0 | 109 | 90½ |
| *Overseas Electric Supply* | | | | | | | | |
| Calcutta Elec. | £1 | 21/6 | | 6† | 6† | 5 11 6 | 22/6 | 20/9 |
| East African Power | £1 | 21/9 | +9d | 7 | 7 | 6 8 9 | 24/6 | 19/9 |
| Nigerian Elec. | £1 | 21/- | | 10 | 10 | 9 10 6 | 27/- | 21/- |
| Palestine Elec. "A" | £1 | 21/- | | Nil | Nil | — | 22/9 | 21/- |
| Perak Hydro-Elec. | £1 | 21/6 | +3d | 10 | 10 | 9 6 1 | 22/3 | 17/9 |
| *Equipment and Manufacturing* | | | | | | | | |
| Aberdare Cables | 5/- | 12/6 | +6d | 12½ | 17½ | — | 14/6 | 11/- |
| Aerialite | 1/- | 6/6 | +9d | 88⅛ | 45* | 6 18 6 | 6/7 | 5/3 |
| Allen, W. H. | £1 | 73/9 | −1/3 | 20 | 20 | 5 8 6 | 83/9 | 75/- |
| Aron Elec. Ord. | £1 | 55/6 | | 15 | 15 | 5 8 0 | 63/9 | 55/6 |
| Assoc. Elec. Ord. | £1 | 78/6 | +3/- | 11¼ | 14 | 3 11 3 | 96/- | 62/6 |
| Automatic Tel. & El. | £1 | 61/3 | | 15 | 15* | 4 18 0 | 79/6 | 60/- |
| Babcock & Wilcox | £1 | 77/6 | +2/6 | 12* | 15 | 3 17 6 | 98/- | 68/6 |
| Baldwin, H. | 2/- | 5/- | +3d | 20 | 20 | 8 0 0 | 5/6 | 4/4 |
| Bakelite | 10/- | 32/- | | 12½ | 16 | 5 0 0 | 34/6 | 27/- |
| British Aluminium | £1 | 48/9 | +1/3 | 10 | 12 | 4 18 3 | 58/- | 35/3 |
| B.I. Callender's | £1 | 45/6x.r. | | 10 | 10 | — | 55/3 | 44/9 |
| B.I. Callender's 6% Pref. | £1 | 23/6 | | 6 | 6 | 5 2 2 | 26/6 | 21/9 |
| British Thermostat | 5/- | 30/- | | 27½ | 27½ | 4 11 9 | 35/- | 22/6 |
| British Vac. Cleaner | 5/- | 6/6 | | 25 | 30 | — | 10/- | 6/6 |
| Brook Motors | 10/- | 44/6 | | 20 | 20* | 4 10 0 | 46/3 | 39/9 |
| Brush Ord. | 5/- | 7/6 | | 6 | 10 | 6 13 3 | 9/6 | 7/6 |
| Bulgin, A. F. | 1/- | 7/- | +3d | 30 | 45 | 6 8 6 | 8/- | 4/- |
| Burco Dean | 5/- | 12/3 | −3d | — | — | — | 17/3 | 12/6 |
| Chloride El. Storage | £1 | 65/- | | 12½ | 17½ | 5 7 9 | 77/6 | 58/6 |
| Clarke Chapman | £1 | 92/6 | | 20 | 20* | 4 6 6 | 102/6 | 68/9 |
| Cole, E. K. | 5/- | 20/6 | +1/9 | 27½ | 17¼* | 4 5 3 | 25/6 | 18/3 |
| Cossor, A. C. | 5/- | 9/6 | +6d | 10 | 15 | 7 18 0 | 14/- | 8/9 |
| Crabtree | 10/- | 29/- | +1/- | 20 | 20 | 6 18 0 | 34/6 | 27/6 |
| Crompton Parkinson Ord. | 5/- | 16/- | +1/- | 20 | 16* | 5 0 0 | 19/9 | 15/- |
| De La Rue | 5/- | 20/- | +2/- | 20 | 30 | 7 10 0 | 26/- | 17/- |
| Decca | 4/- | 37/6 | +3/- | 35 | 56¼* | — | 48/9 | 31/- |
| Desoutter | 5/- | 31/3 | | 20 | 25 | 4 0 0 | 35/- | 25/6 |
| Dewhurst | 2/- | 10/- | | 19 | 24 | 4 16 0 | 10/6 | 7/3 |
| Dictograph Tel. | 2/- | 7/6 | | 20 | 20 | 5 6 9 | 9/3 | 6/6 |
| Dubilier Condenser | 1/- | 4/6 | | 25 | 25* | 5 11 0 | 5/7 | 3/1 |
| E.M.I. | 10/- | 27/6 | +1/- | 10 | 15 | 5 9 0 | 37/- | 25/3 |
| Electrical Components | 5/- | 13/9 | | 20 | 25 | 9 1 9 | 21/3 | 13/9 |
| Elec. Construction | £1 | 30/- | −9d | 15 | 8½* | 5 13 3 | 41/3 | 30/- |
| Enfield Cable Ord. | £1 | 20/- | | Nil | Nil | Nil | 25/3 | 20/- |
| English Electric | £1 | 61/6 | +1/6 | 10 | 12½ | 4 1 3 | 86/9 | 54/3 |
| English Electric 3¾% Pref. | £1 | 14/6 | +6d | 3¾ | 3¾ | 5 3 6 | 16/9 | 14/- |
| Ericsson Tel. | 5/- | 40/- | | 25† | 25†* | 3 2 6* | 46/6 | 29/- |
| Ever Ready | 5/- | 32/6 | +2/6 | 40 | 35* | 5 7 9 | 38/- | 22/3 |
| Falk Stadelmann | £1 | 46/6 | | 15 | 15 | — | 52/6 | 42/- |
| G.E.C. Ord. | £1 | 61/6 | +1/6 | 12½ | 14 | 4 11 0 | 80/3 | 51/3 |
| G.E.C. 6½% Pref. | £1 | 25/3 | | 6½ | 6½ | 5 3 0 | 28/4 | 23/6 |
| General Cables | 5/- | 15/9 | | 30 | 30 | 9 10 6 | 17/- | 15/- |
| Greenwood & Batley | £1 | 50/- | −2/6 | 17½ | 17½ | 7 0 0 | 57/6 | 50/- |
| Hackbridge Cable | 5/- | 20/9 | +6d | 20 | 25 | 6 3 6 | 22/6 | 14/- |
| Hackbridge & Hewittic | 5/- | 20/9 | +6d | 25 | 30 | — | 24/9 | 17/- |
| Hall Tel. Acc. | 10/- | 28/- | +1/- | 10 | 10 | 3 11 6 | 28/9 | 11/- |
| Heatrae | 2/- | 5/- | | 12½ | 15 | 6 0 0 | 5/9 | 4/3 |
| Henley's | 10/- | 16/9 | +3d | 10½ | 10½ | 6 5 6 | 21/3 | 15/9 |
| Holophane | 5/- | 18/3 | +9d | 25 | 30 | 8 4 6 | 19/9 | 16/- |

* After scrip issue. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

in July, and that they usually produce the results about the middle of November. With the price of the 4s ordinary shares at 16s (having been over 20s earlier in the year) the yield works out at nearly 4½ per cent on the basis of last year's 17½ per cent dividend, which was covered by earnings equivalent to nearly 70 per cent on the capital of £2·9 million. In the last annual report the chairman reported that some reduction of profits might result in 1954-5 from the policy of holding down selling prices. He also indicated the need for the maintenance of conservative dividend policies for the benefit of a heavy programme of capital investment.

## in Electrical Investments

| Company or Board | Nom. Value | Middle price 31st Oct. | Week's Rise or Fall | Dividend Previous | Dividend Last | Yield % | 1955 Highest | 1955 Lowest |
|---|---|---|---|---|---|---|---|---|
| *Equipment and Manufacturing—continued.* | | | | | | £ s d | | |
| Hoover | 5/- | 37/6 | +1/6 | 45 | 70 | 9 6 9 | 52/6 | 35/6 |
| I.C.I. | £1 | 48/9 | +2/6 | 15 | 10* | 4 2 0 | 61/9 | 38/3 |
| Intl. Combustion | 5/- | 17/- | | 20 | 25 | — | 24/6 | 16/- |
| Johnson & Phillips | £1 | 40/- | | 15 | 15 | 7 10 0 | 52/6 | 40/- |
| Lancashire Dynamo | £1 | 45/6 | +1/6 | 14 | 15 | — | 56/6 | 37/3 |
| Laurence, Scott | 5/- | 16/- | | 20 | 12½* | 3 18 3 | 19/6 | 14/6 |
| Lister, R. A. | £1 | 28/9 | | 12 | 9·3* | 6 9 0 | 40/- | 28/9 |
| London Elec. Wire | £1 | 52/6 | +1/3 | 10 | 12½ | 4 15 3 | 61/3 | 50/6 |
| Lucas, J. | £1 | 42/6 | +1/3 | 10·8 | 7½* | 3 10 6 | 56/6 | 40/- |
| Marryat & Scott | 2/- | 10/3 | | 25 | 30 | 5 17 0 | 13/- | 9/6 |
| Mather & Platt | £1 | 60/9 | +9d | 15 | 13·4* | — | 75/- | 48/- |
| Metal Industries | £1 | 26/3 | | 9 | 9 | 6 17 3 | 38/- | 26/3 |
| Midland Elec. Mfg. | £1 | 50/- | +1/3 | 15 | 10* | 4 0 0 | 55/- | 44/- |
| Morphy-Richards | 4/- | 28/3 | +9d | 35 | 50 | 7 1 6 | 35/- | 27/- |
| Murex | £1 | 60/9 | +1/3 | 15 | 15 | 4 18 9 | 66/- | 49/3 |
| Newman Ind. | 2/- | 2/9 | | 10 | 10 | 7 5 6 | 3/6 | 2/4 |
| Oldham & Son | 1/- | 2/9 | | 17½ | 20 | — | 3/6 | 2/1 |
| Parnall (Yate) | 5/- | 8/3 | −3d | 8 | 14 | 8 9 9 | 13/2 | 7/3 |
| Parsons, C. A. | £1 | 76/3 | | 7½ | 10 | 2 12 6 | 100/- | 56/- |
| Plessey | 10/- | 70/- | +6/3 | 30 | 20* | 2 17 3 | 89/- | 57/6 |
| Pye Deferred | 5/- | 22/6 | +1/3 | 20 | 12½* | 2 15 6 | 23/9 | 14/3 |
| Revo | 10/- | 13/- | +6d | 27½ | 9* | 6 18 6 | 15/6 | 12/6 |
| Reyrolle | £1 | 93/9 | | 13¾ | 15 | 3 4 0 | 127/6 | 89/- |
| Rheostatic | 4/- | 12/3 | | 20 | 22½ | — | 14/3 | 9/3 |
| Richardsons Westgarth | 5/- | 15/- | | 15 | 16⅝ | 5 11 3 | 19/- | 11/- |
| Scottish Cables | 4/- | 17/3 | +3d | 27½ | 27½ | 6 7 6 | 22/6 | 16/9 |
| Smith (England), S. | 4/- | 16/- | +9d | 15 | 17½ | 4 7 6 | 20/- | 15/- |
| Southern Areas | £1 | 30/6 | | 7½ | 10 | 6 11 3 | 38/- | 27/6 |
| Strand Elec. | 5/- | 8/- | +3d | 17½ | 15* | 9 7 6 | 13/3 | 7/6 |
| Sturtevant | 5/- | 30/- | | 18·9 | 14·4†* | 2 8 0† | 35/9 | 21/- |
| Sun. Elec. | £1 | 35/- | | 15 | 15 | 8 11 6 | 35/- | 33/9 |
| Switchgear & Cowans | 5/- | 15/- | | 10 | 20 | 6 13 3 | 17/- | 11/- |
| Taylor Tunnicliff | 5/- | 13/6 | −6d | 12½ | 15 | 5 11 0 | 16/3 | 11/3 |
| T.C.C. | 10/- | 45/6 | −2/- | 30 | 25* | 5 10 0 | 53/9 | 41/- |
| T.C. & M. | £1 | 30/- | | 8½ | 8½ | 5 13 4 | 40/9 | 29/3 |
| Telephone Mfg. | 5/- | 8/6 | +6d | 10 | 10 | 5 17 9 | 11/6 | 7/9 |
| Thorn Elec. | 5/- | 21/3 | +2/6 | 20 | 15* | 3 10 6 | 33/- | 13/9 |
| Thornycroft | £1 | 42/6 | | 15 | 15* | 7 1 3 | 47/6 | 34/6 |
| Tube Investments | £1 | 95/- | +5/- | 17½ | 22½ | — | 107/6 | 72/6 |
| Vactric | 5/- | 16/3 | | 10 | 15* | 4 12 3 | 22/- | 12/- |
| Veritys | 5/- | 10/6 | | 12½ | 12½ | 5 19 0 | 12/3 | 7/- |
| Wallsall Conduits | 4/- | 14/- | +6d | 70 | 70 | — | 17/3 | 12/- |
| Ward & Goldstone | 5/- | 35/- | | 50 | 30* | 4 5 9 | 45/- | 32/6 |
| Watford | 2/- | 7/- | | 22½ | 25 | — | 8/9 | 6/3 |
| Westinghouse Brake | £1 | 86/3 | | 16 | 18 | 4 3 6 | 110/- | 82/- |
| West, Allen | 5/- | 12/9 | | 17½ | 15* | 5 17 8 | 16/6 | 8/- |
| Wolf Electric | 5/- | 21/6 | +6d | 17½ | 20 | 4 13 0 | 21/6 | 16/1 |
| *Trusts, Transport and Communications* | | | | | | | | |
| Anglo-Am. Tel.: | | | | | | | | |
| A. Ord. | 100 | 74½ | +3 | 6 | 6 | 8 1 10 | 88 | 67½ |
| Ord. | 100 | 45 | | 3¾ | 3¾ | 8 6 8 | 54½ | 45 |
| Anglo-Portuguese | £1 | 25/- | | 8 | 8 | 6 8 0 | 27/- | 21/- |
| Brit. Elec. Traction: | | | | | | | | |
| Def. Ord. | 5/- | 20/6 | +6d | 50 | 22½* | 5 9 9 | 24/3 | 19/6 |
| Cable & Wireless: | | | | | | | | |
| Ord. | £1 | 41/6 | +1/6 | 9 | 10 | 4 16 6 | 54/- | 39/6 |
| 4% Loan | 100 | 92½ | | 4 | 4 | 4 6 6 | 100 | 92 |
| Calcutta Trams | £1 | 25/9 | | 6† | 7½† | 5 16 6† | 26/3 | 20/- |
| Cape Elec. Trams | £1 | 18/9 | | 5½ | 7½ | 8 0 0 | 19/6 | 16/6 |
| Marconi Marine | £1 | 31/3 | | 10 | 10 | 6 8 0 | 41/3 | 31/3 |
| Oriental Tel. Ord. | 1/- | 82/6 | +2/6 | 16 | — | — | 102/6 | 72/6 |
| Telephone Rentals | 5/- | 11/3 | +6d | 10 | 12½ | 5 11 0 | 13/6 | 9/6 |

### Crompton Parkinson Results

With an expansion of just on 10 per cent in the trading profit for the year ended last March, Crompton Parkinson are able to maintain, with a comfortable margin, the ordinary dividend at the equivalent of last year's rate. The final distributions bring the total to 16 per cent on capital increased by the 25 per cent scrip issue to £3·9 million. From the preliminary profits statement it appears that the amount of the payment is covered between two and three times over by the net surplus. At 16s the 5s shares offer a yield of around 5 per cent.

### Broadcast Relay

The 100 per cent scrip issue by Broadcast Relay Service has been completed, and the old and new shares now rank equally. With the growth in the popularity of wired radio and television relay systems, these 5s shares have proved to be among the most paying and consistently active investments in the industrial market during the past year or two. At their present price of a little less than 20s, their value is well below the levels reached earlier this year, but has doubled itself within the past four years, during which shareholders have had rights to new shares on favourable terms.

Although affected by rising taxation and other charges, the growth in the net profits of Broadcast Relay Service has been substantial enough to enable the company to raise the ordinary dividend by moderate stages from 13 per cent on capital of £808,000 in 1949-50, to 22½ per cent on capital of £1,808,000 (part of which is held by British Electric Traction) in the latest completed period, when earnings were equivalent to 32 per cent. (These rates are all free of tax). Following the scrip issue, it is the Board's present intention to recommend a total of 12½ per cent tax-free on the doubled capital.

### Aerialite Dividend

Aerialite's final dividend of 27½ per cent applies to capital doubled since last year by a share-for-share capitalization issue, and increased further to £200,000 by a one-for-three "rights" issue. With the interim of 17½ per cent paid before the latter, the total of 45 per cent represents a small increase on the 88½ per cent paid for several previous years. Cover for the present distribution has been widened to two-and-a-half times as a result of the improvement of 50 per cent in the net profit to £120,000, despite a much larger tax charge. Growing demands for the products are mentioned in the annual report, which anticipates a continuance of successful progress in the current year's trading.

# REPORTS and DIVIDENDS

**Crompton Parkinson, Ltd.**—The preliminary statement for the year ended 30th June last shows a consolidated income of £2,236,420, as compared with £2,047,291 for the preceding year, and after deducting stamp duty in connection with increase of capital, £8,750, taxation, £1,228,894, and transfer to specific reserves, £58,041, there is a net balance of £940,735, against £838,175. Minority interest and profits retained in subsidiaries total £41,203, leaving £899,532 available to the parent company. It is proposed to pay a final dividend on the ordinary stock of 6 per cent, and a bonus of 6 per cent, making 16 per cent for the year, on capital of £3,870,684 as increased by a scrip issue of one-for-four. For the previous year the total distribution on the smaller capital was 20 per cent. Taxation and other provisions no longer required, etc., amount to £273,255, and after deducting £33,868, trade investments written off, the balance carried forward is £743,259 (against £308,264 brought in).

**The British Electric Transformer Co., Ltd.**, reports a net profit, after charging depreciation, taxation and provisions, of £35,252 for the year to 30th June last, as compared with £82,979 for the previous year. To this is added taxation and other provisions no longer required of £15,019. It is proposed to pay a dividend for the year of 1s 3d on the 5s ordinary shares (against 3s), and a special dividend of 6d per share, free of tax (against nil).

**Morphy-Richards, Ltd.**—The main figures in the accounts for the year ended 30th June last were given in our issue of 14th October. In his statement, circulated with the report and accounts, Mr. H. D. Drysdale (chairman) says that the backbone of the business still is its electric iron, of which there are now four models. Sales of the new steam iron are increasing in volume. The company has considerably increased its output of fires and the convector heater in particular is gaining increasing popularity. Toasters continue to sell well, but the greatest increase in any one line has been the hair dryer. The development of new products continues, but their introduction must await the provision of additional manufacturing capacity.

Despite the fact that turnover increased in the past year by some 50 per cent, there is still a large unsatisfied demand for their products, and they have recently concluded financial arrangements under which another new factory of 125,000 sq ft will be built and rented to them. This new building, which will be alongside of the existing new east factory, will effectively double the manufacturing space. The company are not providing the capital cost of the building, but they will have to provide a considerable sum in equipping the new factory with plant and machinery. They do not anticipate that the new factory will be completed before the end of 1956.

Referring to the subsidiary companies, Mr. Drysdale says that the Australian subsidiary has had another satisfactory year and there has been a marked improvement in Canada, the subsidiary there having contributed this year to the group profit. Conditions in Argentina continue to preclude any trading and the associated company there is dormant in the meantime. Conditions in the refrigerator market have rather deteriorated since the acquisition of Astral Equipment, Ltd. The restrictions on hire purchase have seriously struck at refrigerator sales and this, coupled with intensive competition, have discounted the immediate profit-earning estimates which had been formed. The directors, however, have no doubts about the long-term prospects. The results for the first three months of the current year show once again a substantial increase over the previous year, but what with credit restrictions and budgetary uncertainties (Mr. Drysdale's review was issued before the Chancellor of the Exchequer had made his statement) it is too early yet to form any definite opinions about the outcome for the year.

**Aerialite, Ltd.**, reports that the net profit for the year to 31st May last, after charging £123,992 for taxation, is £120,435, as compared with £78,886 for the preceding year. General reserve receives £80,533 and it is proposed to pay a final dividend of 27½ per cent on the £200,000 ordinary capital as increased by a one-for-one scrip issue and a subsequent one-for-three rights issue. An interim dividend of 17½ per cent has already been paid on £150,000 capital before the rights issue. For the previous year a total of 88½ per cent was paid on £75,000 capital.

**Lightalloys, Ltd.**—A loss of £15,948 is reported for the year to 26th June last, as compared with a profit of £11,875 for 1953-54. The balance is struck after providing £17,811 for depreciation, but there is no taxation charge (against £5,190). No dividend is recommended (against 10⅝ per cent for 1953-54).

**Contactor Switchgear, Ltd.**—The trading profit for the year to 31st July last is £115,621, as compared with £124,889 for 1953-54. Taxation absorbs £60,453 and £35,000 is placed to general reserve. After adding £3,000 taxation recovered, and £6,002 balance brought in, the sum available is £29,170. It is proposed to pay a final dividend of 12 per cent, making 18 per cent for the year. For the previous year the total distribution was 22½ per cent on smaller capital. The balance carried forward is £8,470.

**Veritys, Ltd.**—At the requisition of certain members of the company an extraordinary general meeting is called for 22nd November to consider resolutions to remove from office Messrs. H. B. T. Wilde (chairman) and A. W. Hiley (one of the managing directors) and to appoint to the board Messrs. P. E. C. Merryfield and J. A. Robertson.

In a statement circulated with the notice calling the meeting Mr. Wilde refers to matters leading up to the requisition. He says that in June last he was approached by the chairman of another company with a view to a merger of the two companies, but after investigation and because of the dissimilarity of the two businesses the proposed merger was not proceeded with. In August Mr. Merryfield wrote to him saying that certain shareholders were dissatisfied with the progress of the company. Mr. Wilde says that he cannot understand this because after the loss incurred in 1950 and the subsequent change in management, profits rose from £25,986 in 1951 to £54,391 in 1954.

The board has no doubt of the wisdom of its rejection of the proposed merger although it is fully alive to the advantages which might accrue from a merger with another company concerned with products complementary to its own. Mr. Wilde considers that it would be unwise to change the present experienced management and asks shareholders to vote against the resolutions.

**Bakelite, Ltd.**, has announced an interim dividend of 5 per cent (unchanged).

**The Ebonite Container Co., Ltd.**, has declared a second interim dividend of 12½ per cent, making 17½ per cent to date on increased capital.

**The Anglo-Portuguese Telephone Co., Ltd.**, is paying an interim dividend of 3 per cent (unchanged) on increased capital.

## Increases of Capital

**Brentford Transformers, Ltd.**—Increased by £120,000, in 5s ordinary shares, beyond the registered capital of £30,000.

**R. M. Catterson-Smith, Ltd.**—Increased by £5,000, in £1 ordinary shares, beyond the registered capital of £5,000.

**Sydney S. Bird & Sons, Ltd.**—Increased by £235,000, in 2s shares, beyond the registered capital of £65,000.

## New Companies

**Square D, Ltd.**—Registered 28th September. Capital £100. Electrical and electronic engineers, etc. The first directors are not named. Regd. office: 5, Bishopsgate, E.C.2. (See *Electrical Review*, 7th October, p. 693.)

(*Continued on page* 915)

We are exhibiting at the BUILDING EXHIBITION, Stand 242, Row L, Olympia—November 16-30

# It's an awkward position but an EASY FIXING

Here, as in every fixing job, there's only one way to ease, speed and efficiency—Rawlplug Fixing Devices and Tools.
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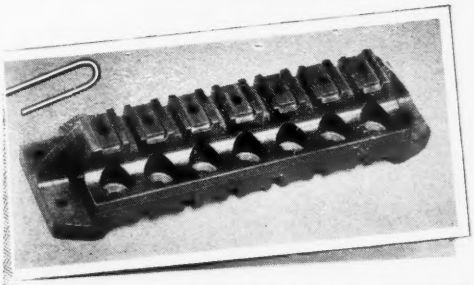
*Rawlplugs, Rawltools, Rawlbolts, Rawltamps, Rawlnuts, Bolt Anchors, Screw Anchors, White Bronze Plugs, Rawltoggles, Rawlclips, Cement in Sockets, Durium Drills and Hole Boring Tools for Hand, Electric Hammer or Pneumatic Hammer operation.*

**INTER-OFFICE MEMORANDUM**

From WORKS Manager

To Production Superintendent
copy: Purchasing Department.

Subject: Works Requisition order 8562 – 200 Finger Boards



Why on earth are we messing about trying to make these fiddling things here?
ASK PERMALI to take the whole job over and supply the finished components TESTED and ready for assembly – they'll fit and we'll get them!
J.E.S

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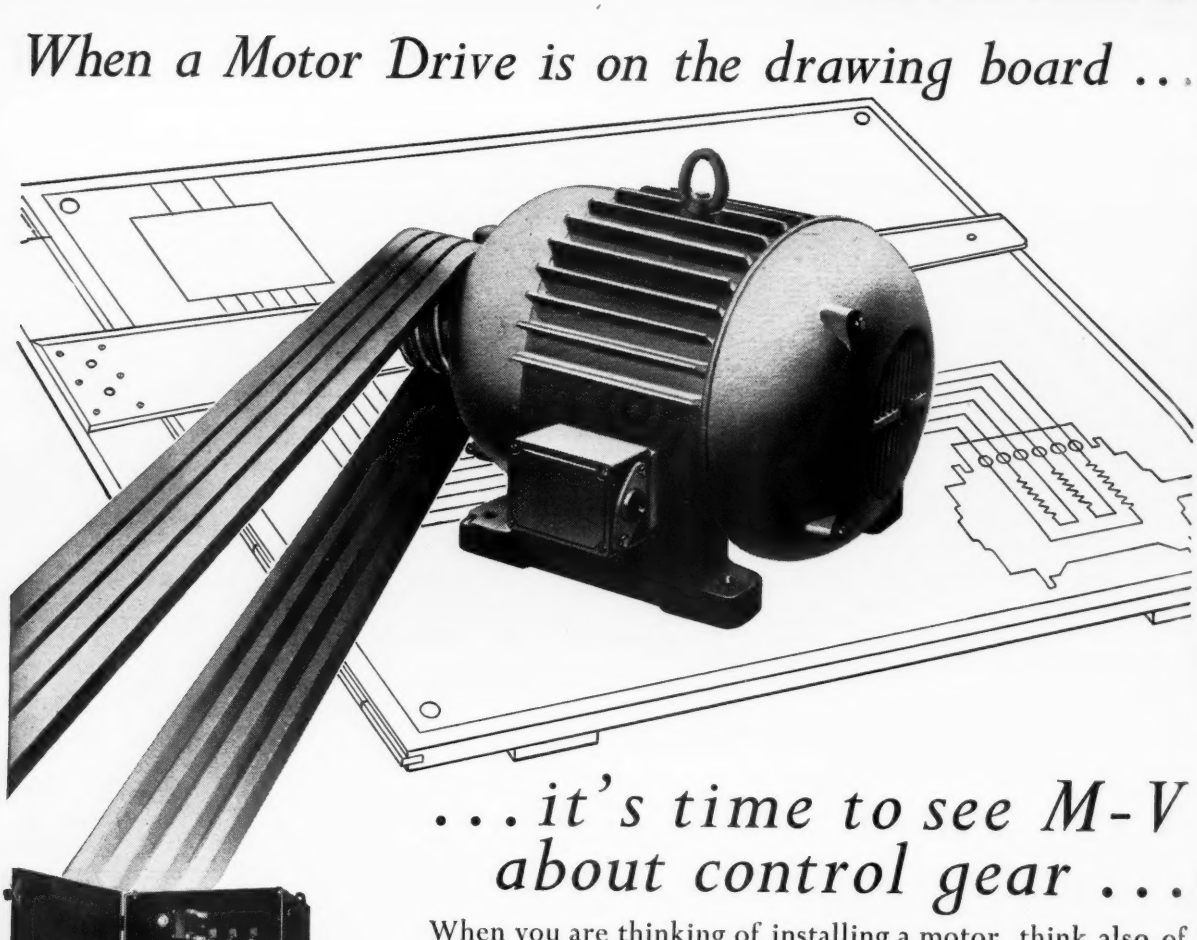
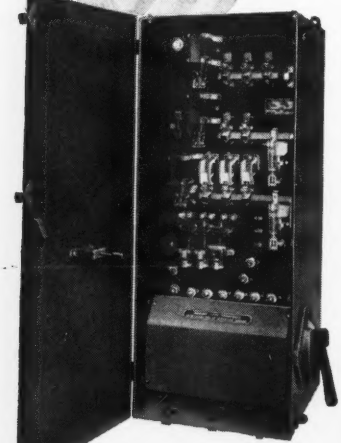
# *When a Motor Drive is on the drawing board . . .*

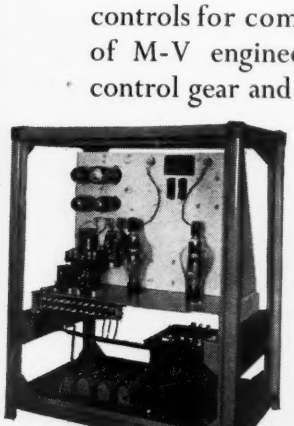


## *. . . it's time to see M-V about control gear . . .*

When you are thinking of installing a motor, think also of Metrovick control gear. Trouble, time and cost are saved by consulting M-V when a motor drive is in the planning stage. M-V design and build all types of control gear from switch-starters for fractional hp motors to elaborate electronic controls for complex industrial processes. The experience of M-V engineers therefore covers the complete range of control gear and their practical advice is at your service.



*M-V Stator-rotor Contactor Starter*



*M-V Electronic Speed-control Equipment*

*M-V Hand-operated Oil-break Starter*

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H/A 005

## FINANCIAL SECTION (*continued*)

**James Lambert (Radio), Ltd.**—Registered 6th October. Capital £1,000. Manufacturers, merchants and repairers of, and dealers in, all classes of radio goods, equipment, etc. Directors: J. Lambert and Mrs. Alice Lambert. Regd. office: 109, Burnley Road, Padiham, Lancs.

**Bull & Lott, Ltd.**—Registered 17th September. Capital £100. Electrical engineers and contractors, etc. Directors: J. D. Bull and P. W. Lott. Regd. office: 51, Crawford Street, W.1.

**E. J. Britton & Sons, Ltd.**—Registered 15th October. Capital £1,000. Electrical engineers and contractors, etc. Directors: E. J. Britton, J. C. French and W. Lewis. Regd. office: 101, Leadenhall Street, E.C.3.

**Servico (Manchester), Ltd.**—Registered 24th September. Capital £3,000. Manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, etc. Directors: A. Fleming and Mrs. Vera Fleming. Regd. office: 110, Claremont Road, Moss Side, Manchester.

**Robert Garmany & Son, Ltd.**—Registered in Belfast 8th September. Capital £5,000. Electrical engineers and contractors, plumbers and gas fitters, etc. The first directors are not named. Regd. office: 33, Queen Street, Belfast.

**Marquess Products, Ltd.**—Registered 25th August. Capital £5,000. Manufacturers, importers and exporters of and wholesale and retail dealers in electrical fittings and appliances, radio and television sets, etc. Directors: L. W. Sefton and A. Townsend (secretary). Regd. office: Bristol House, 18-23, Holborn Viaduct, E.C.1.

**Lexicon Electrical Appliances, Ltd.**—Registered 26th August. Capital £25. Manufacturers of and dealers in electrical goods, etc. Directors: P. Javanaud and J. L. Standen. Secretary: Pierre Javanaud. Regd. office: 4, Norland Square, W.11.

**Curtis Securities, Ltd.**—Registered 30th August. Capital £100. To acquire any interests in patents, brevets d'invention and the like relating to the design, construction and manufacture of electrical and mechanical instruments and machinery, tools, etc. Directors: T. H. Curtis (managing director and chairman), G. J. Readman and J. H. Nickson. Regd. office: Lincoln Chambers, Banbury, Oxon.

**C. C. Shackleton & Sons, Ltd.**—Registered 4th October. Capital £15,000. To acquire the business carried on by C. C. Shackleton at Kingswood, Glos, as "C. C. Shackleton," and to carry on the business of electricians, radio, television and refrigeration plant manufacturers, dealers in electrical apparatus, etc. C. C. Shackleton is the first director. Regd. office: 101, Regent Street, Kingswood, Glos.

**Telecommunications, Ltd.**—Registered in Dublin 1st July. Capital £100. Manufacturers and assemblers of electrical apparatus, equipment and machinery of all kinds, etc. The first directors are not named.

**Forbes Electrical Industries, Ltd.**—Registered 23rd September. Capital £1,000. Manufacturers of and dealers in chokes, suppressors, condensers, valves and electrical and electronic apparatus, etc. Directors: W. Roberts and N. Hoad. Regd. office: 14, Bedford Street, W.C.2.

**K. Howe & Son, Ltd.**—Registered 20th September. Capital £1,000. Manufacturers of and dealers in electronic apparatus, radio and television sets, etc. Directors: A. E. Howe and K. Howe. Regd. office: 583, Selby Road, Leeds, 15.

**A.T.I. Developments, Ltd.**—Registered 24th September. Capital £500. Manufacturers and assemblers of and dealers in electric and electronic apparatus, etc. Directors: A. T. Izzard, L. D. H. Izzard and B. G. Izzard. Regd. office: 70, High Road, Broxbourne, Herts.

### Bankruptcies

**P. A. Cockcroft,** 9, Spain Court, Boston, Lincs, formerly carrying on business as a radio and electrical engineer at Brook House, Penrhyn Avenue, Rhos-on-Sea, Denbigh.—Trustee, Mr. E. C. Stimpson, 27, Regent Street, Park Row, Nottingham, Official Receiver, released 22nd October.

**W. Zack,** 111, Lordship Road, Stoke Newington, London, N.16, electrical contractor.—Receiving order made 19th October on a creditor's petition.

**G. E. Stephens,** 142-144, Old High Street, Grays, Essex, electrical contractor.—Receiving order made 19th October on a creditor's petition.

**K. Hanson,** electrical engineer, carrying on business as Hanson's Electronics, at 2, Hall Street, Burnley, and 1, Parker Lane, Burnley.—Receiving order made 18th October on debtor's own petition. Public examination 10th January at the Court House, Bankhouse Street, Burnley.

**H. Parkinson,** trading as Electrolite Engineers at 9, Market Street, Hindley, near Wigan.—Public examination 1st December at the Court House, Crawford Street, Wigan.

**E. W. White,** 5, Greenfield Road, Southmead, Bristol, electrical contractor.—Trustee, Mr. P. W. Hort, 28, Baldwin Street, Bristol, 1, appointed 20th October.

### Liquidation

**E. Duckworth (Preston), Ltd.,** electrical contractors, 106, Leyland Road, Penwortham, near Preston.—Meetings of creditors and contributories 2nd November at the Official Receiver's office, 20, Byrom Street, Manchester, 3.

# Lighting Conferences for Architects

The first of a series of conferences for architects, organized by the Lighting Service Bureau, was held at the Bureau in London on 20th October, when Mr. A. D. S. Atkinson gave a paper on "The Use and Abuse of Modern Electric Lamps." Mr. V. C. H. Creer, chairman of the Council of E.L.M.A., in introducing Mr. Atkinson, said that he hoped that the lectures to be given in the series would inspire discussion and give both architects and lighting engineers an insight into each other's problems. In his paper, Mr. Atkinson described the various types of lamps available and their applications, and dealt in some detail with fluorescent lighting.

*Architects' lighting conference. Left to right: Mr. W. J. Jones (director, E.L.M.A.), Mr. V. C. H. Creer (chairman of the E.L.M.A. Council), Mr. C. S. White, Anne Valery (on whom the lecturer demonstrated various types of fluorescent lighting), and Mr. A. D. S. Atkinson*

# NEXT WEEK'S EVENTS

*Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged*

### Monday, 7th November

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. "The Electrification of the Manchester-Sheffield-Wath Lines, Eastern and London Midland Regions, British Railways," by J. A. Broughall and K. J. Cook.

HULL.—Y.E.B., Ferensway, 7 p.m. I.E.S. Leeds Centre. "Some Developments in Fluorescent Lighting," by Dr. H. H. Ballin.

ILFORD.—Angel Hotel, 8 p.m. A.S.E.E. N.E. London Branch. "Any Questions?"

LEEDS.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Colour Psychology."

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey & North Wales Centre. "The Standardization of Retail Electricity Tariffs," by A. O. Johnson and N. F. Marsh.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "Lagrange's Principle as the Basis of a Unified Treatment of the Action of Electrical Indicating Instruments," opened by D. Rutenburg.

Caxton Hall, S.W.1, 7 p.m. E.P.E.A. London Technical Group. "Quick Starting of Turbines," by P. F. Carson.

Burlington House, 5.30 p.m. Society of Engineers. "Investigation into the Design of the Superstructure of a Power Station," by C. W. E. Dudley.

NEWCASTLE-UPON-TYNE. — King's College, 6.15 p.m. I.E.E. North-Eastern Radio & Measurements Group. "An 8-MeV Linear Accelerator for X-Ray Therapy," by C. W. Miller.

County Hotel, Neville Street, 6 for 6.30 p.m. North East Electrical Club. "Oil, Fuel and Smog," by H. W. Hastings.

SHEFFIELD.—Royal Victoria Station Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. "Radio Frequency Heating," by J. Pound.

### Tuesday, 8th November

BELFAST.—Queens University, 6.30 p.m. I.E.E. Northern Ireland Centre. "Maintenance Principles for Automatic Telephone Exchange Plant," by R. W. Palmer.

BIRMINGHAM.—Exchange & Engineering Centre, Stephenson Place, 7 p.m. Institution of Works Managers, Birmingham Branch. "Electronic Computors in the Office."

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio & Telecommunication Section Group. Radio & Telecommunication Section Chairman's address, by H. Stanesby.

DERBY.—East Midlands Electricity Board, Service Centre, 6.30 p.m. I.E.E. East Midland Centre. "The Electrification of the Manchester-Sheffield-Wath Lines, Eastern and London Midland Regions, British Railways," by J. A. Broughall and K. J. Cook.

EDINBURGH.—11, Atholl Crescent, 7.30 p.m. Edinburgh Electrical Society. "Space Heating," by W. M. Stevenson.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Education Discussion Circle. Discussion on "The Varying Methods of Educating Electrical Engineers," opened by H. J. Towse.

LONDON.—Café Royal. I.E.E. Measurement & Control Section. Section dinner.

Connaught Rooms, W.C.2, 12.30 for 1 p.m. Electrical Industries Club luncheon.

85, Minories, E.C.3, 5.30 p.m. Institute of Marine Engineers. "A Review of Deck Auxiliaries Supplied to Vessels with A.C. Supply," by A. S. Brown.

At the Lighting Service Bureau, 2, Savoy Hill, 6 p.m. Illuminating Engineering Society. "Efficiency of Fluorescent Lamps," by F. Jackson, R. Molloy and K. Scott.

At the Institution of Electrical Engineers, Savoy Place, 5 p.m. Institution of Post Office Electrical Engineers, London Centre, ordinary meeting. "Economic Principles of Telecom's Plant Provision," by N. V. Knight.

MANCHESTER. — Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, Manchester Branch. "Power without Smoke," and "Distinguished Company," films by Brook Motors, Ltd.

College of Technology, 7.30 p.m. Society of Instrument Technology, Manchester Section. "The Future of Semi-Conductors in Industry," by D. D. Jones.

### Wednesday, 9th November

ABERDEEN.—Caledonian Hotel, 7.30 p.m. I.E.E. North Scotland Sub-Centre. "Thermionic Valves of Improved Quality for Government and Industrial Purposes," by E. G. Rowe, P. Welch and W. W. Wright.

BIRMINGHAM.—James Watt Institute, 6.30 p.m. I.E.E. South Midland Students' Section. "D.C. Traction," by P. H. Evans.

Imperial Hotel, Temple Street, 6 p.m. Institute of Fuel, Midland Section. "The Work Entailed in Creating Smokeless Zones," by R. Williams.

HALIFAX.—Crown Hotel, 7.30 p.m. A.S.E.E. Halifax Branch. Film show.

HUDDERSFIELD. — Y.M.C.A., 16, John William Street, 7 p.m. I.E.S. Leeds Centre. "Modelling with Light and Colour," by J. W. Howell.

Technical College, 7.30 p.m. Institution of Production Engineers, East & West Ridings Region, Halifax Graduates' Section. "Electronics as an Aid to Productivity," by R. McKennell.

LANCASTER. — N.W.E.B., Demonstration Theatre, North Road, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. "Proving the Performance of Circuit-Breakers, with particular reference to those of Large Breaking Capacity," by J. Christie, H. Leyburn and J. F. Bird. "New Testing Station for High-Power Circuit-Breakers," by J. Christie, H. Leyburn and R. W. Fenn.

LIVERPOOL.—Chamber of Commerce, 1, Old Hall Street, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "The Dekatron Tube in a Digital Transmission System," by G. Shand.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio & Telecommunication Section. "A Transistor Digital Fast Multiplier with Magneto-Strictive Storage," by Dr. G. B. B. Chaplin, R. E. Hayes and A. R. Owens.

MANCHESTER. — Engineers' Club, Albert Square, 6.45 p.m. I.E.E. North-Western Radio & Telecommunication Group. "High-Speed Electronic-Analogue Computing Techniques," by Dr. D. M. MacKay.

NEWCASTLE-UPON-TYNE. — King's College, College Road, 6.15 p.m. I.E.S. Newcastle Centre. "The Architect's Approach to Artificial Lighting Design," by G. Grenfell Baines.

Neville Hall, Westgate Road, 6 p.m. British Institution of Radio Engineers, North-Eastern Section. "Turret Tuners for Multi-Channel Television Reception," by R. Holland.

NORTHAMPTON. — College of Technology, 7.15 p.m. Northampton & District Electrical Association. "Electric Space Heating and Thermal Storage," by J. N. Rycroft.

NORTH WEMBLEY. — I.E.E. London Graduates' & Students' Section. Visit to G.E.C. Lamp and Glass Works, at 2 p.m.

NOTTINGHAM.—County Hotel, 7 p.m. Incorporated Plant Engineers, East Midlands Branch. "Atomic Energy and the Future," by J. A. Dixon.

OXFORD.—37, George Street, 7 p.m. I.E.E. district meeting. "Lightning Surges on Electrical Supply Systems," by Dr. R. H. Golde.

RUGBY. — College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. "Automatic Circuit Reclosers," by G. F. Peirson, A. H. Pollard and N. Care.

SHEFFIELD.—The University, St. George's Square, 7 p.m. Society of Instrument Technology, South Yorkshire Section. "Instrumentation of a Nuclear Power Plant," by K. R. Sandiford.

WIMBLEDON.—Guild House, 32, Worple Road, 8.15 p.m. A.S.E.E. South-West London Branch. "Electronics in Industry," by Dr. L. E. C. Hughes.

WOLVERHAMPTON. — Wolverhampton & Staffordshire Technical College, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midlands Section. "Closed Circuit Industrial Television," by H. A. McGhee.

YORK.—"The Shambles Café," 7.15 p.m. A.S.E.E. York Branch. "Electrical Equipment of Motor Vehicles."

### Thursday, 10th November

BIRMINGHAM. — Botanical Gardens Ball Room, Westbourne Road, Edgbaston. I.E.S. Birmingham Centre. Ladies' night.

DUNDEE.—Queen's College, 7 p.m. I.E.E. North Scotland Sub-Centre. "Thermionic Valves of Improved Quality for Government and Industrial Purposes," by E. G. Rowe, P. Welch and W. W. Wright.

GLASGOW.—39, Elmbank Crescent, 7 p.m. British Institution of Radio Engineers, Scottish Section. "Some Applications of Electronics to Marine Echo-Sounding," by F. Baillie.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. ordinary meeting. "Germanium and Silicon Power Rectifiers," by T. H. Kinman, G. A. Carrick, R. G. Hibberd and A. J. Blundell. (Utilization Section paper.)

Grosvenor House, Park Lane, W, 7 for 7.30 p.m. Public Transport Association. Annual dinner.

Manson House, Portland Place, 7 for 7.30 p.m. Institute of Welding, North London Branch. "Automatic Argon Arc Welding of Low Alloy Steels," by F. J. Wilkinson.

Hope House, 45, Great Peter Street, 7 p.m. Women's Engineering Society, London Branch. "Engineers in Management," by B. E. Bosworth Munck.

SWANSEA.—S. Wales Electricity Board Showrooms, The Kingsway, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. "Design, Performance and Application of Miniature Circuit-Breakers," by H. W. Wolff and T. G. F. Atherton.

### Thursday, 10th November, to Sunday, 13th November

EASTBOURNE.—Grand Hotel. Scientific Instrument Manufacturers' Association. Annual convention.

### Friday, 11th November

BIRMINGHAM.—Grand Hotel, 6.15 p.m. Birmingham Electric Club. "The Germanium Power Rectifier," by G. A. Carrick.

BRISTOL.—Grand Hotel, 7.30 p.m. A.S.E.E. Bristol & West of England Branch. "Back Pressure Steam Turbines," by D. N. de Matos.

CREWE.—Royal Hotel, 8 p.m. A.S.E.E. Stoke & Crewe Branch. Films—"Steel and Atomic Energy."

EDINBURGH.—North British Station Hotel, 6.30 p.m. I.E.E. South-East Scotland Sub-Centre. "An Outline of Developments in Electric Power Stations," by C. W. Marshall (Joint meeting with the Scottish Branch of the Institution of Mechanical Engineers.)

ILFORD.—Angel Hotel. A.S.E.E. North-East London Branch. Annual dinner.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Utilization Group. "Timing the Operation of Control Systems Associated with Rotating Equipment," by C. Cuthbert and D. A. Picken and "The Dynamic Braking of Induction Motors," by Dr. D. Harrison.

[*Continued at foot of next page*

# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

## CONTRACTS OPEN

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.*

**Banff.**—Corporation. Contractors wishing to tender for trunk road lighting should notify the borough surveyor. (See this issue.)

**Belfast.** — 1st December. Electricity Department. Workshop equipment for Belfast West power station extension. (See this issue.)

**Carlisle.**—City Council. Electrical installations in 162 houses. City engineer, 18, Fisher Street.

**Dundee.**—3rd December. North of Scotland Hydro-Electric Board. Steelwork in building extensions to the turbine room and boiler house, etc., at Carolina Port power station. (See this issue.)

**Egypt.**—29th November. Cairo Electricity and Gas Administration. Thirty 500 kVA and seventy 300 kVA transformers. (E.S.B. 22797/55. Ten/16318.)*

**Greece.**—26th November. State Procurement Service, Athens. Accumulators and materials for making accumulators. (E.S.B. 23082/55. Ten/16366.)*

**Honiton.**—3rd December. Corporation. Trunk road lighting equipment. (See this issue.)

**India.**—17th November. Central Stores Purchase Organization, Industry and Supply Department, Government of Saurashtra, Rajkot. H.v. switchgear. (E.S.B. 22721/55. Ten/16290.)*

23rd November. Madras Port Trust. Four electric cargo lifts. (E.S.B. 22774/55. Ten/16287.)*

15th December. Superintending Engineer, Electrical, Madras. 132 kV and 66 kV transformers and a synchronizing panel. (E.S.B. 23276/55. Ten/16363.)*

**Irish Republic.**—30th November. An Bord Lascaigh Mhara. Refrigeration equipment. (E.S.B. 22799/55. Ten/16326.)*

**Keswick (Cumberland).**—U.D.C. Electrical installations in houses to be erected on the Latrigg Close estate. Surveyor, Council Offices, Main Street.

**Maryport (Cumberland).**—U.D.C. Supply and installation of 33 sodium street lamps. D. Thompson, surveyor, Town Hall.

## NEXT WEEK'S EVENTS

### Friday, 11th November (*continued*)

LONDON.—Grosvenor House, W, 7 p.m. Electrical Industries Benevolent Association. Annual ball.

Caxton Hall, S.W.1, 6.30 p.m. E.P.E.A. Southern Meter Engineers' Group. "Relays for Network Protectors," by W. Salter.

Pepys House, 14, Rochester Row, 7 p.m. Junior Institution of Engineers. "Nuclear Research Installation at the Hammersmith Hospital," by F. A. Smith.

SWANSEA. — Central Library, Alexandra Road, 7.30 p.m. Institution of Production Engineers, Wales Region, West Wales Section. "Influence of Electrical Power on Production," by W. P. Warren.

Osborne Hotel, Langland Bay, 7 p.m. I.E.E. West Wales (Swansea) Sub-Centre. Annual dinner and dance.

### Saturday, 12th November

LONDON.—Bush House, Aldwych. Institution of Engineers-in-Charge. Ladies' night.

Caxton Hall, S.W.1. Junior Institution of Engineers. Annual dance.

**New Zealand.**—28th February. State Hydro-Electric Department, Wellington. Six 66 kV, 1,500 MVA circuit-breakers for the Hororata substation. (E.S.B. 23295/55. Ten/16393.)* 6th March. 10,000 kVA, 11/33 kV transformer bank and spare unit. (E.S.B. 23294/55. Ten/16380.)*

8th December. Stores Division, G.P.O., Wellington. Circuit-breakers. (E.S.B. 23413/55. Ten/16427.)* 14th December. Cable and conductors. (E.S.B. 23411/55. Ten/16418.)*

16th December. Auckland Electric Power Board. Street lighting fittings. (E.S.B. 23399/55. Ten/16426.)*

18th November. Dunedin Electricity Department. Lead sheathed underground cable. (E.S.B. 23367/55. Ten/16391.)*

**St. Helens.**—Education Committee. Work at Grange Park Secondary Technical School, including electrical installation. (See this issue.)

**South Africa.**—10th November. Union Tender and Supplies Board, Pretoria. H.v. switchgear for New City telephone exchange, Johannesburg. (E.S.B. 22832/55. Ten/16304.)* 24th November. Magneto extension bells. (E.S.B. 22841/55. Ten/16313.)*

23rd November. Stores Department, South African Railways. V.i.r. underground cable. (E.S.B. 23302/55. Ten/16369.)* Insulated electric cable. (E.S.B. 23067/55. Ten/16370.)* 25th November. Signalling cable. (E.S.B. 23305/55. Ten/16377.)* Electric passenger lifts. (E.S.B. 23070/55. Ten/16378.)* Electric cable. (E.S.B. 23069/55. Ten/16389.)* 30th November. Heat-resisting cables. (E.S.B. 23475/55. Ten/16409.)* Electric cable. (E.S.B. 23474/55. Ten/16422.)*

**Southern Rhodesia.**—7th December. City Electrical Engineer, Bulawayo. Eighteen 30 kVA, thirty-six 500 kVA, and twelve 100 kVA transformers. (E.S.B. 22745/55. Ten/16314.)*

**Taunton.**—21st November. Corporation. Electrical goods for one year from 1st January next. L. Atwell, town clerk, Municipal Buildings.

**United States.**—29th November. Corps of Engineers, Portland, Oregon. Lightning arrestors, bus insulators and disconnecing switches for the Dallas Dam power station. (E.S.B. 22250/55. Ten/16327.)*

**Uruguay.**—2nd December. Usinas Electricas y los Telefonos del Estado, Montevideo. Lead and plastic covered cables. (E.S.B. 22436/55. Ten/16334.)*

25th November. Administracion Nacional de Combustibles Alcohol y Portland. Seaworthy armoured cable. (E.S.B. 23557/55. Ten/16437.)*

**West Riding.**—21st November. County Council. Renewal of electrical installation at Castleford Grammar School. (See this issue.)

## ORDERS PLACED

**Birkenhead.**—Corporation Education Committee. Accepted. Electrical installation at Woodchurch Secondary School for Girls (£5,158).—F. Hancock (1939), Ltd.

**Glasgow.**—Education Committee. Electrical installation work at Lightburn Senior Secondary School (£18,815).—J. B. Meiklejohn, Ltd.

**Swindon.**—Corporation Education Committee. Acepted. Re-wiring of the Euclid Street School (£1,783).—J. Lott & Sons.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

## WORK IN PROSPECT

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

**Aberdeen.**—Houses (350); Scottish Special Housing Association, Ltd., 15/21, Palmerston Place, Edinburgh.

**Accrington.**—Dwellings (88), Burnley Road; borough surveyor.

**Barrow-in-Furness.**—Block of offices, Duke Street, for London and Manchester Assurance Co.; Bowden, Son & Partners, architects, 3, Adelaide Terrace, London, N.1.

**Barry.**—Development of Colcot shopping centre and houses (35), Crogan Hill; borough surveyor, Town Hall, Holton Road.

**Croydon.**—Works extensions; Southern Foundries, Ltd., Purley Way.

Maisonnettes (38), Campden Road; Property Management (Croydon), Ltd., 22, Laud Street.

Office block; Hall & Co., Ltd., Cherry Orchard Road.

Houses (64), Falconwood Road, Addington; Camberwood Properties, Ltd., 1258, London Road, S.W.16.

**Doncaster.**—Extensions to the Royal Infirmary, in six phases (£2,100,000) for Sheffield Regional Hospital Board; Pite, Son & Fairweather, architects, 6, Queen Anne's Gate, London, S.W.1.

**Easington.**—Pithead baths, Deaf Hill Colliery; N.C.B. Architects' Department, Ashfield Towers, Gosforth, Northumberland.

**Ellesmere Port.**—Block of shops and offices for Ravenseft Properties, Ltd.; Lionel H. Fewster & Partners, architects, 22, Conduit Street, London, W.1.

**Eton.**—Houses (26), Denham Green estate, for R.D.C.; Sir John Brown, A. E. Henson & Partners, architects, 117, Sloane Street, London, S.W.1.

**Felling (Co. Durham).**—Cinema, Leam Lane estate, for A. Woolf; Stephenson Gillis and Partners, architects, Saville Chambers, North Street, Newcastle-on-Tyne.

**Glasgow.**—Flats (48), Arden; Scottish Special Housing Association, Ltd., 15-21, Palmerston Place, Edinburgh.

**Hartlepool.**—Additions to the works of Steetley Magnesite Co., including installation of electrically operated pumping plant; own architects.

**Ilford.**—Offices, garages, store, etc., Ley Street; Ansell & Bailey, architects, 12, Grays Inn Square, London, W.C.1.

**Jarrow.**—Additions to the Jarrow installation of Shell Mex & B.P., Ltd., including offices, canteen and maintenance buildings; Tarslag, Ltd., general contractors, Bowesfield Lane, Stockton-on-Tees.

**Kirkby.**—St. Laurence's R.C. Secondary School; Lionel A. G. Prichard & Son, architects, The Gables, Moor Lane.

**Leeds.**—Dwellings (50), Spen Lane and Vesper Lane; city architect.

**Leicester.**—Five-storey headquarters building in Charles Street; Leicester Temperance Building Society, Belvoir Street.

Girls' school, New Parks estate (£238,376), and new secondary modern school in Rushey Fields; city architect.

**Lincoln.**—Four-storey block and assembly hall extension for technical college; county architect, Lincoln.

**Liverpool.**—Ambulance garage at Westminster House, for Regional Hospital Board (£11,430); Hughes & Stirling, Ltd., Brasenose Road, Bootle.

**Llangollen.**—Factory (£25,000); Caldecot Press, Ltd., Berwyn Works, Holyhead Road.

**London.**—Offices and showroom, Spray Street, Woolwich; L. H. Mildwater & Sons, 37, Woolwich New Road, S.E.18.

Extensions to King's College Hospital Medical School, Denmark Hill (£90,000); Pite, Son & Fairweather, architects, 6, Queen Anne's Gate, London, S.W.1.

**Long Eaton.**—Factory, Nottingham Road, for Wallis & Co. (Long Eaton), Ltd.; F. Perks & Son, Ltd., Bridge Street, Long Eaton.

**Luton.**—Completion of college of further education (£412,500); Norman & Dawbarn, architects, 5, Gower Street, London, W.C.1.

**Manchester.**—Large new block of shops and offices at St. Peter's Square; Fred Mitchell & Son, Ltd., River Place, City Road.

Cottage flats (40), Gorton estate; Sutton Dwellings Trust, Victoria House, Southampton Row, London, W.C.1.

**Mansfield.**—Works extensions; Stokes Castings, Ltd., Union Street.

**Middlesbrough.**—Thirteen shops and 18 flats, Park End estate (£47,000); R. H. Bailey & Son, builders, Denmark Street.

**Morden.**—Crematorium; Oscar Faber & Partners, consulting engineers, 29, Queen Anne Street, London, W.1.

**Newcastle-on-Tyne.**—Fire station, Cowgate area; city architect, 18, Cloth Market.

Five new Methodist churches (£150,000); Newcastle Methodist District Synod.

**Newport (Mon).**—Works extensions (£500,000); Monsanto Chemicals, Ltd., 13, Maddox Street, London, W.1.

**Northampton.**—Extensions to Spencer Boys' and Girls' Secondary Modern Schools (£85,000); county architect, County Offices, Guildhall Road.

**Northwich.**—Factory, Cumberland Street, for British Crepe, Ltd.; Cooper Bros. & John Clayton, Ltd., Catherine Street, Macclesfield.

**Oldham.**—Child welfare centre at Hollins and Waterhead; borough architect.

**Peterborough.**—Block of six lock-up shops, with two-bedroomed maisonnettes, Walton estate (£12,000); city architect, Bridge Street.

**Rayleigh.**—Erection of Sweyne Secondary Grammar/Technical School (£225,000); H. Conolly, county architect, County Hall, Chelmsford.

**Sedgley.**—Crematorium, Gornal Wood Cemetery; J. T. Lewis, architect, Priory Hall, Dudley.

**Shipley.**—Works and offices, Otley Road; Herbert Walker & Son, Ltd., Wellcroft Works, Manor Lane.

**Southport.**—New Church of Our Lady of Lourdes; F. Pritchard, architect, The Gables, Moor Lane, Kirby, Liverpool.

**Spalding.**—Out-patients' and physiotherapy departments at the Johnson Hospital; E. E. Cracknell, St. Thomas Road.

**Spennymoor.**—Blocks of flats; G. H. Gray & Partners, Camden, North Shields.

**Stokesley.**—Grammar and modern school; Gollins, Melvin, Ward & Partners, architects, 15, Manchester Square, London, W.1.

**Sunderland.**—Additions covering 25,000 sq ft for Steel & Co., engineers, Pallion, Sunderland.

R.C. church, Hylton Road; Matkin & Hawkins, architects, Barclays Bank Chambers, Fawcett Street.

**Walsall.**—Factory; Talbot Stead Tube Co., Ltd., Green Lane.

**Watford.**—Houses (154), Meriden estate; S. G. Sage, borough surveyor, Town Hall.

**West Bromwich.**—Factory and offices in Hamstead Road, for Henry Showell & Co., manufacturing jewellers, 28, Nursery Road, Birmingham, 19; T. Dunkley Hogg, architect, 1, Church Street, Oldbury.

**Whitley Bay.**—Garage (£50,000); G. Davidson & Sons, Ltd., North Shields.

**Woking.**—R.C. mixed primary school, for Trustees of R.C. Diocese of Southwark; Goodhart-Rendel, Broadbent & Curtis, architects, 22, Whitehall, London, S.W.1.

# NEW PATENTS

## Electrical Specifications Recently Published

*The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 7th December from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

**1951**

857. Staatsbedrijf der Posterijen Telegrafie en Telefonie.—Simplex radio-telephone system comprising a fixed station and a plurality of mobile stations. 11th January, 1951. (741541.)

11085. Cossor, Ltd., A. C.—Coupling links for wave guides. 1st May, 1952. (741543.)

26249. Electric & Musical Industries, Ltd.—Velocity modulated electron-discharge devices for effecting frequency modulation. 21st October, 1952. (741415.)

**1952**

2191. Automatic Telephone & Electric Co., Ltd.—Automatic telephone exchange systems. 15th January, 1953. (741545.)

6917 & 9744. Soc. d'Electronique et d'Automatisme.—Electric adding and subtracting devices. 17th March and 17th April, 1952. (741418 & 741420.)

17365. General Electric Co., Ltd., and Gledhill, G. A.—Electric sawtooth voltage oscillation generators. 6th July, 1953. (741600.)

18786. General Electric Co., Ltd., and Goodings, D. B.—Electric protective systems. 24th July, 1953. (741423.)

26094. British Thomson-Houston Co., Ltd.—Ultra-violet lamps. 17th October, 1952. (741556.)

26549. Associated Electrical Industries, Ltd.—Apparatus for measuring optical thicknesses. 23rd November, 1953. (741557.)

27732. National Research Development Corporation.—Circuit arrangements providing a variable phase shift. 4th February, 1954. (741482.)

33094. N.S.F., Ltd.—Lever-operated electric switches. 24th December, 1953. (741564.)

**1953**

794. Electric & Musical Industries, Ltd.—Variable-speed driving mechanisms. 11th January, 1954. (741569.)

2491. General Electric Co., Ltd., and Amies, D.—Vacuum lifters. 12th January, 1954. (741672.)

2618. Haynes, J. K.—Gas flow responsive electric switch devices. 29th January, 1954. (741484.)

5449. General Electric Co., Ltd., and Little, J. G.—Electric pulse distributors. 15th February, 1954. (741430.)

6149. General Electric Co.—Clothes-washing machines. 5th March, 1953. (741674).

7680. Wickman, Ltd.—Electrical smoothing apparatus. 6th May, 1954. (741490.)

9624. Steatit-Magnesia Akt.-Ges.—Dielectrics. 9th April, 1953. (741614.)

9798. British Thomson-Houston Co., Ltd.—Recurrent generators. 12th April, 1954. (741580.)

9848. Electricité de France Service National.—Processes and devices for utilizing the energy of waves. 10th April, 1953. (741494.)

10015. British Thomson-Houston Co., Ltd.—Apparatus for treating stem assemblies for electric lamps and like devices. 13th April, 1953. (741495.)

10954. Soc. d'Electronique et d'Automatisme.—Electric pulse reshaping circuits. 21st April, 1953. (741438.)

12357. Stevens Manufacturing Co., Inc.—Snap acting thermostat. 4th May, 1953. (741443.)

14393. M-O Valve Co., Ltd., Butcher, C. H., and Widdowson, A. E.—Manufacture of grid electrodes for electric discharge devices. 21st May, 1954. (741621.)

17366. Plessey Co., Ltd.—Potentiometers and variable resistors. 23rd June, 1954. (741505.)

17373. English Electric Co., Ltd.—Open cycle gas turbine power plants. 18th June, 1954. (741506.)

18967. Autophon Akt.-Ges.—A.c. ringers. 8th July, 1953. (741447.)

20224 & 20778. General Electric Co.—Electric transformers. 21st and 27th July, 1953. (741449 & 741451.)

20901. National Cash Register Co., Ltd.—Electrical gating circuits. 9th March, 1954. (741452.)

21765. Aita, P.—Electric soldering irons. 6th August, 1953. (741512.)

23714. General Electric Co.—Generator excitation systems. 27th August, 1953. (741518.)

26494. British Thomson-Houston Co., Ltd.—Electrical waveguides. 12th August, 1954. (741,640.)

28802. British Thomson-Houston Co., Ltd.—Electrical timing circuits. 19th October, 1953. (741587.)

29558. General Electric Co.—Electronic computing apparatus applicable inter alia to resistance welding monitor and control systems. 26th October, 1953. (741642.)

30041. Philips Electrical Industries, Ltd.—Cathode-ray tubes. 30th October, 1953. (741533.)

30661. Doulton & Co., Ltd.—Insulators for overhead electric conductors. 25th January, 1955. (741705.)

32364. Telefunken Ges., formerly Telefunken Ges. für Drahtlose Telegraphie.—Multiplex pulse signalling systems. 23rd November, 1953. (741708.)

33487. Philips Electrical Industries, Ltd.—Methods of manufacturing terminal strips each comprising a plurality of contact members insulated from one another. 2nd December, 1953. (741464.)

33506. Collins Radio Co.—Thermionic oscillator circuit. 2nd December, 1953. (741,465.)

34544. Soc. Forni Lubatti.—Method for improving the working conditions of electric furnaces heated by the electric resistance of slag and a device for realizing the method. 11th December, 1953. (741468.)

**1954**

13998. Automatic Telephone & Electric Co., Ltd.—Automatic telephone exchange systems. 15th January, 1953. (741589.)

19476. Pye, Ltd.—Television transmitting apparatus. 8th September, 1952. (741649.)

## TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 19th November:—

KOLSTERPHONE. No. B742,332, Class 9. Radio and telephone apparatus; and loud speakers.—Kolster-Brandes, Ltd., Cray Works, Sidcup, Kent.

MAGNETHERMIC. No. B736,815, Class 9. Low frequency induction furnaces (not for experimental purposes).—Magnethermic Corporation, Youngstown, Ohio, U.S.A. Address for service, c/o Lloyd, Wise, Bouly & Haig, 10, New Court, Lincoln's Inn, London, W.C.2.